Government of Karnataka
School education department

DSERT Bengaluru
and
DIET Tumkur

Question Bank
With Solutions
For
Lesson Based Assessment

SCIENCE

2025-26

9

Ninth Standard

Concept and Guidance

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Content

LEARNING OUTCOMES

Serial number of Units	Learning outcomes
PART-1	
Unit-1 Matter in our surroundings	1. Explain the physical properties of substances. 2. Classify matter into solids, liquids and gases based on their physical properties. 3. Explain the properties of solids, liquids and gases. 4. Differentiate between the states of matter, solids, liquids and gases. 5. Understand the changes in state of matter and explain the interconversion of states of matter. 6. Define evaporation and Explains the factors that influence evaporation. 7. Identify the application of evaporation and vaporization in daily life. 8. Define latent heat, latent heat of vaporization, latent heat of liquid.
Unit-2 Is matter in our surroundings pure	1. Understand about mixtures 2. Recognize solution and its properties 3. Recognize suspension 4. Interpret about colloids and its properties 5. Conduct experiment on Tyndall effect 6. Differentiate between physical change and chemical change 7. Differentiate between elements and compounds 8. Identify the physical properties of metals and non-metals
Unit-5 Fundamental unit of life	1. Describe the structure and function of a microscope: Students should be able to describe the main parts of a microscope and their functions. 2. Describe the structure and function of cell organelles: Understand the role of nucleus, mitochondria, chloroplasts, ribosomes, lysosomes, and other organelles. 3. Explain the differences between prokaryotic and eukaryotic cells: Compare and contrast the structure and function of prokaryotic and eukaryotic cells. 4. Describe cellular transport osmosis and diffusion. 5. Describe the processes of energy production in cells. 6. Explain cell division: Describe the processes of mitosis and meiosis, including the stages and significance of each.
Unit-6 Tissues	1. Define tissue and understand their importance in living organisms 2. Identify and describe types of plant tissues 3. Identify different types of Meristematic tissues and understand the importance of meristematic tissue in growth in plants

	4. Explain and identify permanent tissues and its types. 5. Identify different types of permanent tissues and explain their function. 6. Explain the role of xylem and phloem in transportation of water and food materials in plants. 7. Identify and explain types of animal tissues 8. Explain the structure and function of animal tissues. 9. 10.Draw diagram of various tissues.
Unit-7 Motion	1. Describe Motion 2. Distinguish Uniform Motion and Non uniform motion 3. Understand the Measuring Rate of Motion, Speed, Average speed, speed with direction, velocity, Average velocity, rate of change of velocity and acceleration. 4. Learn Graphical Representation of Motion 5. Understand Distance - Time Graph and Velocity Time Graph 6. Write Equations of Motion 7. Understand Uniform Circular Motion
Unit-8 Force and laws of motion	1.Define the meaning of force and differentiate balanced and unbalanced forces. 2.Explain first law of motion. 3.Relate inertia and mass. 4.Derive and formulate second law of motion. 5.Illustrate third law of motion. 6.Solve problems.
PART-2	
Unit-3 Atoms and molecules	1. Define the law of Conservation of Mass. 2. Define the law of definite proportion. 3. Identify the symbol of atoms, ions and molecules. 4. Explain the atomic mass and method of calculating atomic mass. 5. Explain the concept of chemical formula
Unit-4 Structure of atom	1. List the charged particles present in an atom, the postulates and drawbacks of various models of atom how other scientist overcome them, use of various isotopes in their day to day life. 2. Appreciate the contributions made by the scientist who discovered protons neutrons and electrons, explain how they conducted simple experiments, illustrate how the scientist discovered these particles and draw conclusions out of the experiments made from scientist. 3. Differentiate protons, neutrons and electrons based on characteristics. 4. Identify when these particles were discovered, the number of electrons present in the outermost shell,

	5. Define the terms like Canal Ray, isotopes and isobars, atomic number and mass number. 6. Draw diagrams of Thomson and Bohr's model of atom. 7. Give reasons and justify for various aspects like the position of protons, neutrons and electrons, for why certain elements loose or gain electrons, why the atomic mass number of certain elements are in decimals. 8. Mention the rules followed to write electronic configuration 9. Write electronic configuration for different elements. 10. Calculate the valencies of different elements. 11. Identify symbol, atomic number, mass number, number of protons neutrons and electrons for the given element. 12. Give examples for inert gases, positive and negative ions, isotopes and isobars 13. Distribute the electrons in various shells and abbreviate the symbolic representation of element. 14. Calculate the atomic number, mass number, number of neutrons, protons or electrons from by using formula. 15. Compare atomic number and mass number.
Unit-9 Gravitation	1. Know the concept of gravity and universal law of gravitation. 2. Understand the objects in free fall and acceleration due to gravity. 3. Apply the laws of motion on free falling bodies. 4. Explain the difference between mass and weight. **5.** Understand the concepts of thrust pressure and buoyancy
Unit-10 Work and energy	1. Understand and explain the scientific concept of work. 2. Differentiate between positive and negative work. 3. Define ‘Power’. 4. List the sources and various forms of energy. 5. Define kinetic energy in scientific and mathematical terms. 6. Define potential energy scientific and mathematical terms. 7. Differentiate between kinetic energy and potential energy with examples. 8. Explain the law of conservation of energy and understand its importance in everyday processes. 9. Explain the rate or capacity of work done 10. Calculate problems on work, kinetic energy, potential energy and capacity.
Unit-11 Sound	1 Explain the mode of sound production in humans. 2. Differentiate between longitudinal and transverse waves. 3. Define the characteristics of sound waves like Frequency, Wave length, Amplitude, Time period and Speed. 4. Understand the SI units of Frequency,Wave length,Time period and Speed of sound. 5. Differentiate between Tone and Note, Echo and Reverberation, Ultrasonic sound and Infrasonic sound. 6. Understand the speed of sound in different media. 7. Solve the problems based on sound. 8. List out the applications of multiple reflection of sound.

	9. Explain the techniques of Echo Cardiography and Ultrasonography.
Unit-12 Improvement in food resources	1. Understand the meaning and necessity of food 2. Understand nutrients and their sources 3. Understand the importance of crop yield 4. Understand the stages of crop yield 5. Understand the seasons, their types and the crops grown 6. Understand transgenic plants and their uses 7. Understand the desirable qualities and the influence of biotic and abiotic factors in crop improvement 8. Understand plant nutrients, their types with examples. 9. Understand the types of fertilizers, their uses. 10. Understand organic farming, the benefits of organic farming. 11. Understand the problems caused by excessive use of fertilizers. 12. Understand the traditional methods of irrigation. 13. Understand crop protection and its management 14. Understand dairy farming and the benefits of dairy farming 15. Understand animal husbandry and the importance of animal husbandry. 16. Understand the breeds of livestock, poultry, chicken, honey and their economic uses in animal husbandry.

PART-1

1 Matter in our surroundings

Learning outcomes:

Students are able to

1. Explain the physical properties of substances.
2. Classify matter into solids, liquids and gases based on their physical properties.
3. Explain the properties of solids, liquids and gases.
4. Differentiate between the states of matter, solids, liquids and gases.
5. Understand the changes in state of matter and explain the interconversion of states of matter.
6. Define evaporation and Explains the factors that influence evaporation.
7. Identify the application of evaporation and vaporization in daily life.
8. Define latent heat, latent heat of vaporization, latent heat of liquid.

Weightage according to difficulty level

Questions	Easy	Average	Difficult	Total
MCQ	6	1	--	7
VSA 1M	6	5	2	13
SA 2M	--	4	4	8
LA 3M	1	6	1	8
LA 4M	--	--	--	--
LA 5M	--	--	--	--
Total	13	16	7	36

Weightage according to Objective

Questions	Remembering	Understanding	Application	Skill	Total
MCQ	5	2	--	--	7
VSA 1M	8	5	--	--	13
SA 2M	--	7	1	--	8
LA 3M	1	6	--	1	8
LA 4M	--	--	--	--	--
LA 5M	--	--	--	--	--
Total	14	20	1	1	36

I. **Four alternatives are given for each of the following questions /incomplete statements. Choose the correct alternative and write the complete answer along with its letter of alphabet. (1 Mark)**

1. Among the following this is not the characteristics of matter (Easy)
A. Mass
B. Specific size
C. Colour
D. Density

2. The process of changing a substance from a solid state to a liquid (Easy)

A. Fusion
B. Solidification
C. Vapourisation
D. Condensation

3. The process of changing a solid substance direcctly to a gaseous state with out becoig a liquid (Easy)

A. Vapourisation
B. Fusion
C. Sublimation
D. Solidification

4. The process of changing a gaseous substance direcctly to a solid state with out becoig a liquid (Easy)

A. Sublimation
B. Solidification
C. Deposition
D. Fusion

5. Among the following substance that does not undergo sublimation is (Average)

A. Ammonium chloride
B. Camphor
C. Naphthalene
D. Copper

6. Dry ice is (Easy)

A. Nitrogen gas
B. Solid Carbon di oxide
C. Camphor
D. Mixture of Argon and Neon gasses

7. SI unit of Pressure (Easy)

A. Pascal (Pa)
B. Newton (N)
C. Joule (J)
D. Kelvin(K)

II. Answer the following questions: (1 Mark)

8. Define matter? (Easy)
9. What are the different states of matter? (Easy)
10. The smell of hot sizzling food reaches you several meters away, but to get the smell from cold food you have to go close. Give reason. (Average)
11. What is melting point? (Easy)
12. State SI unit of temperature. (Easy)
13. What is latent heat? (Average)
14. What is latent heat of fusion? (Average)
15. What is boiling point? (Easy)
16. What is latent heat of vaporisation? (Average)
17. Naphthalene balls disappear completely as the time passes. Why? (Average)
18. What is Evaporation? (Easy)

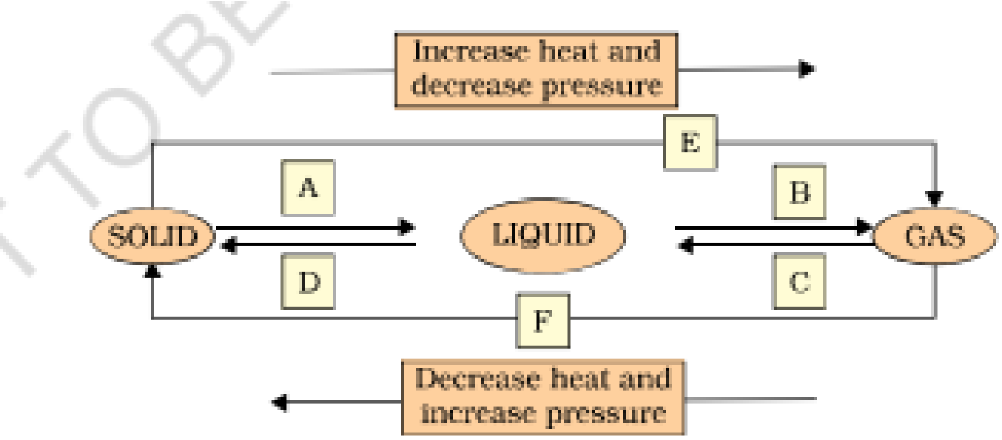
19. Water kept in earthen pot become cool during summer. Justify the statement. (Difficult)
20. Our palm feels cold when we put acetone or petrol or perfume on it. Justify the statement. (Difficult)

III. Answer the following questions: (2 Marks)

21. What are the characteristics of the particles in matter? (Average)
22. Why a wooden table should be called solid? (Average)
23. How do we get aroma of a perfume to few meter distance? (Average)
24. When a solid melt, its temperature remains constant. Why? Give reason. (Difficult)
25. Which of these causes more severe burns, boiling water or steam? Why? Give reason. (Difficult)
26. List the factors that influence evaporation. (Average)
27. We sip hot tea and milk faster from a plate, but not from a glass? Give scientific reason.(Difficult)
28. What type of clothes should we wear during summer? Why? (Difficult)

IV. Answer the following questions: (3 Marks)

29. What is the physical state of water at- (a) 25^0C (b) 0^0C (c) 100^0C? (Average)
30. Convert the following temperature to the Celsius scale. (a) 300K (b) 23K (c) 470K (Average)
31. Convert the following temperature to the Celsius scale. (a) 25^0C (b) 373^0C (c) 100^0C (Average)
32. Define the following: (a) Rigidity (b) Compressibility (c) Density (Easy)
33. We can easily move our hand in air but to do the same through solid block of wood we need a karate expert. Justify the statement.(Difficult)
34. List the difference between solid, liquid and gas.(Average)
35. Draw a neat diagram of Sublimation of Ammonium chloride and label the following parts: (a) Ammonium chloride solidified (b) China dish (Average)
36. Name A, B, C, D, E and F in the following diagram showing change in its states. (Average)



2. Is matter around us pure?

Learning outcomes:

Students are able to

1. Understand about mixtures
2. Recognize solution and its properties
3. Recognize suspension
4. Interpret about colloids and its properties
5. Conduct experiment on Tyndall effect
6. Differentiate between physical change and chemical change
7. Differentiate between elements and compounds
8. Identify the physical properties of metals and non-metals

Weightage according to difficulty level

Questions	Easy	Average	Difficult	Total
MCQ	1	3	1	5
VSA 1M	2	4	4	10
SA 2M	1	2	2	5
LA 3M	1	5	4	10
LA 4M	-	4	1	5
Total	5	18	12	35

Weightage according to Objective

Objectives	Remembering	Understanding	Application	Skill	Total
MCQ	1	2	2	-	5
VSA 1M	3	4	3	-	10
SA 2M	2	2	1	-	5
LA 3M	4	3	2	1	10
LA 4M	-	2	1	2	5
Total	10	13	9	3	35

I. Four alternatives are given for each of the following questions /incomplete statements. Choose the correct alternative and write the complete answer along with its letter of alphabet. (1 Mark)

1. A pure substance among the following is (Easy)

A. Air
B. Pure water
C. Salt solution
D. Sugar solution

2. A homogeneous mixture among the following is (Average)

A. Sand in water
B. Oil in water
C. Sugar in water
D. Milk

3. This is a colloid (Difficult)

A. Salt solution
B. Suspension
C. Milk
D. All the above

4. The phenomenon of scattering of light by colloidal particles is called (Average)

A. Raman effect
B. Tyndall effect
C. Brownian movement
D. None of the above

5. Physical change among the following is (Average)

A. Melting of ice
B. Rusting of iron
C. Burning of paper
D. Digestion of food

II. Answer the following questions: (1Mark)

6. What is a substance? (Easy)
7. What is a mixture? (Average)
8. What is a solution? (Average)
9. What is a colloid? (Difficult)
10. What is a suspension? (Easy)
11. What is an Element? (Average)
12. What is a compound? (Difficult)
13. Define Tyndall effect? (Average)
14. What are metalloids? (Difficult)
15. What is a saturated solution? (Difficult)

III. Answer the following questions: (2 Marks)

16. What are alloys? Give examples. (Average)
17. Differentiate between homogeneous and heterogeneous mixtures with examples. (Average)
18. How do you confirm that colourless liquid given to you is a pure water. (Difficult)
19. Differentiate between elements and compounds with examples. (Difficult)
20. Define a) Solute b) Solvent (Easy)

IV. Answer the following questions: (3 marks)

21. List the properties of a solution (Average)
22. List the properties of a suspension. (Average)
23. Explain Tyndall effect with an experiment. (Average)
24. List the properties of colloidal solution. (Difficult)
25. List the physical properties of metals. (Easy)
26. Differentiate between mixture and compounds. (Difficult)
27. Differentiate between physical change and chemical change with examples. (Average)
28. Write dispersed phase and dispersed medium and example for the following colloids. (Average)
    a. Aerosol b. Gel c. Sol
29. Write the difference between solution, suspension and colloid. (Difficult)
30. Name the technique used to separate the following mixtures (Difficult)
    a. Butter from Curd b. Salt from Sea water c. Camphor from Salt

V. Answer the following questions: (4 Marks)

31. Classify the following as physical and chemical change (Average)
    a. Rusting of iron
    b. Dissolving common salt in water
    c. Melting of ice
    d. Burning of paper

32. Write the steps you would use for making tea. Use the words solution, solvent, solute, dissolve, soluble, insoluble, filtrate and residue. (Average)

33. Classify the following into elements, compounds and mixtures (Average)
    a. Sodium
    b. Soil
    c. Sugar solution
    d. Silver
    e. Calcium carbonate
    f. Tin
    g. Silicon
    h. Carbon dioxide

34. A solution contains 40 g of common salt in 320 g of water. Calculate the concentration in terms of mass by mass percentage of the solution. (Difficult)

35. Write the differences between metals and non-metals with give examples. (Average)

5. The fundamental unit of life

Learning outcomes:

Students are able to:

1. Describe the structure and function of a microscope: Students should be able to describe the main parts of a microscope and their functions.
2. Describe the structure and function of cell organelles: Understand the role of nucleus, mitochondria, chloroplasts, ribosomes, lysosomes, and other organelles.
3. Explain the differences between prokaryotic and eukaryotic cells: Compare and contrast the structure and function of prokaryotic and eukaryotic cells.
4. Describe cellular transport osmosis and diffusion.
5. Describe the processes of energy production in cells.
6. Explain cell division: Describe the processes of mitosis and meiosis, including the stages and significance of each.

Weightage according to difficulty level

Types	**Easy**	**Average**	**Difficulty**	**Total**
MCQ	6	4	--	10
VSA 1M	8	1	--	9
SA 2M	1	8	1	10
LA 3M	2	6	4	12
HOTS	--	1	5	6
Total	17	20	10	47

Weightage according to objective

Questions	**Remember**	**Understanding**	**Application**	**Skill**	**Total**
MCQ	6	4	--	--	10
VSA 1M	5	3	1	--	9
SA 2M	1	7	1	1	10
LA 3M	1	7	2	2	12
HOTS	--	1	5	--	6
Total	13	22	9	3	47

I. Four alternatives are given for each of the following questions /incomplete statements. Choose the correct alternative and write the complete answer along with its letter of alphabet. (1 Mark)

1. Identify the non-membranous organelle from the following (Average)
   A. Ribosome
   B. Endoplasmic reticulum
   C. Nucleus
   D. Chloroplast

2. Plant cell wall mainly composed of (Easy)
   A. Starch
   B. Protein
   C. Cellulose
   D. Lipid

3. The organelles found only in animal cell is (Easy)
   A. Centrioles
   B. Ribosomes
   C. Cellwall
   D. Lysosome

4. Suicide bag of the cell among the following is (Easy)
   A. Ribosome
   B. Vacuoles
   C. Golgi apparatus
   D. Lysosome

5. Undefined nuclear region containing only nucleic acid is called as (Average)
   A. Nucleoid
   B. Eucleoid
   C. Nucleus
   D. Karyon

6. Chromosomes are composed of (Average)
   A. RNA and Protein
   B. DNA and Protein
   C. DNA and Lipid
   D. RNA and Lipid

7. The energy currency of the cell is (Easy)
   A. NADP
   B. ADP
   C. DNA
   D. ATP

8. The organelles that contain its own DNA is (Average)
   A. Mitochondria and Plastid
   B. Mitochondria and ribosome
   C. Ribosome and plastid
   D. None of these

9. Cell membrane is also called as (Easy)

A. Cell wall
B. Semi permeable membrane
C. Nuclear membrane
D. Nucleoplasm

10. Power house of the cell is (Easy)

A. Mitochondria
B. Golgi complex
C. Lysosome
D. Ribosome

II. Answer the following questions: (1 Mark)

11. What is the basic structural and functional unit of life? (Easy)
12. Who discovered cells? (Easy)
13. What is the cell membrane composed of? (Easy)
14. Which organelle is known as the "powerhouse" of the cell? (Easy)
15. What is the function of the nucleus in a cell? (Average)
16. What is cytoplasm? (Easy)
17. Which organelle is responsible for protein synthesis? (Easy)
18. What is the cell wall's primary function? (Easy)
19. Which organelle contains digestive enzymes? (Easy)

III. Answer the following questions: (2 Marks)

20. What is the difference between prokaryotic and eukaryotic cells? (Average)
21. Describe the structure and function of the cell membrane. (Average)
22. What is the role of mitochondria in a cell? Explain with an example. (Average)
23. Differentiate between plant and animal cells. (Easy)
24. Explain the function of the nucleus in a cell. (Average)
25. Describe the function of lysosomes in a cell. (Average)
26. What is the role of ribosomes in protein synthesis? (Easy)
27. Describe the structure and function of the endoplasmic reticulum. (Difficult)
28. What is the significance of cell division in living organisms? (Average)
29. Draw a neat diagram of mitochondria. (Average)

IV. Answer the following questions: (3 Marks)

30. Explain the structure and function of the mitochondria. (Average)
31. Describe the role of the cell membrane in maintaining cellular homeostasis. (Difficult)
32. Differentiate between rough endoplasmic reticulum (RER) and smooth endoplasmic reticulum (SER). (Average)
33. Explain the process of osmosis and its importance in cells. (Difficult)
34. Describe the structure and function of the nucleus. (Average)
35. Explain the role of lysosomes in cellular digestion and recycling. (Difficult)
36. Describe the structure and function of the Golgi apparatus. (Average)
37. Explain the importance of cellular organelles in maintaining cellular functions. (Difficult)
38. Describe the process of cellular respiration and its significance. (Average)

39. Draw a neat diagram of Animal cell and label the following parts: A. Centriole
B. Mitochondria (Average)

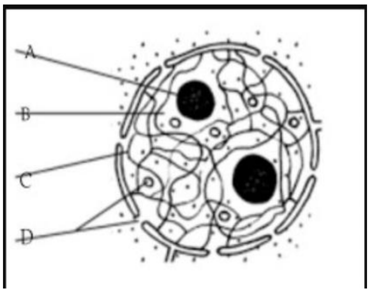
40. Draw a neat diagram of plant cell and label the following parts: A. Chloroplast
B. Cell wall (Average)

V. Identify the given diagram and label the given parts

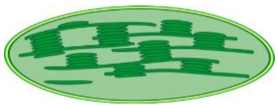
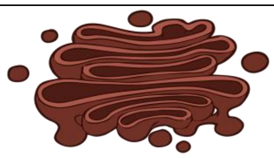
(1 Mark) (Easy)

41.

A.



B. (Easy)

Sl.No	Picture of Organelle	Name of the organelle
1.		
2.		
3.		

VI. Answer the following: (HOTS questions) (All Questions are of difficult level)

42. Why does the skin of your finger shrink when you wash clothes for a long time? (Difficult)
43. A cell is placed in a hypertonic solution. What will happen to the cell, and why? (Average)
44. How does the structure of the mitochondria support its function in cellular respiration? (Difficult)
45. What would be the effect on a plant if its chloroplasts were unable to undergo photosynthesis? (Difficult)
46. How do cells adapt to changes in temperature, and what are the consequences of extreme temperatures? (Difficult)
47. How do cells respond to infections through immune responses? (Difficult)

6. Tissues

Learning outcomes:

Students are able to:

1. Define tissue and understand their importance in living organisms
2. Identify and describe types of plant tissues
3. Identify different types of Meristematic tissues and understand the importance of meristematic tissue in growth in plants
4. Explain and identify permanent tissues and its types.
5. Identify different types of permanent tissues and explain their function.
6. Explain the role of xylem and phloem in transportation of water and food materials in plants.
7. Identify and explain types of animal tissues
8. Explain the structure and function of animal tissues.

10.Draw diagram of various tissues.

Weightage according to difficulty level

Types	Easy	Average	Difficulty	Total
MCQ	2	6	4	12
VSA 1M	4	6	3	13
SA 2M	2	3	2	07
LA 3M	-	1	1	02
LA 4M	-	1	-	01
Total	11	15	11	35

Weightage according to objectives

Questions	Remembering	Understanding	Application	Skill	Total
MCQ	6	4	2	-	12
VSA 1M	5	5	3	-	13
SA 2M	2	2	2	1	07
LA 3M	1	-	-	1	02
LA 4M	-	-	1	-	01
Total	14	11	8	2	35

I. Four alternatives are given for each of the following questions /incomplete statements. Choose the correct alternative and write the complete answer along with its letter of alphabet. (1 Mark)

1.Characteristic of meristematic tissue among this is (Average)

A. Inactive tissue
B. Have thick cell wall
C. Prominent nucleus
D. Having vacuoles

2.The tissue responsible for increasing the girth of the stem is (Average)

A. Apical meristems
B. permanent tissue
C.Lateral meristems
D. intercalary meristems

3.Meristematic tissue lose the ability to divide and they form (Difficult)

A. Apical meristems
B. Permanent tissues
C. Lateral meristems
D.Intercalary meristems

4.The tissue that provide mechanical support to plant is (Easy)

A. Collenchyma
B. Chlorenchyma
C. Aerenchyma
D. Sclerenchyma

5.Air filled cavity in parenchyma to give buoyancy to the aquatic plants is (Average)

A. Aerenchyma
B. Collenchyma
C. Sclerenchyma
D Chlorenchyma

6.A stem of lotus is covered with a waxy substance which is made up of (Difficult)

A. Suberin
B. Pepsin
C.Cuticle
D.Cellulose

7.In this tissue, cells are irreregularly thickened at the corners (Average)

A. Parenchyma
B Collenchyma
C. Sclerenchyma
D.Xylem

8.The husk of coconut and the hard shell of seed is made up of (Difficult)

A.Sclerenchyma
B.Parenchyma
C.Collenchyma
D. aerenchyma

9.Type of connective tissue which has widely spaced cells, solid matrix and composed of proteins (Average)

A. Cartilage
B. Ligaments
C. Epithelial tissue
D. Muscular tissue

10.Connective tissue which have more elasticity (Difficult)

A.Cartilage
B.ligament
C.blood
D. bone

11. Connective tissue which is more elastic is (Average)

A.Cartilage
B.ligament
C.blood

D.bone

12.Tissues that store fat in the body is (Easy)

A.Aereolar

B. epithelial tissue

C. Adipose tissue

D. Tendons

II. Answer the following questions: (1 Mark)

13.Define the term tissue. (Easy)

14.Write any two difference between plant and animal. (Average)

15.What is the utility of tissues in multi-cellular organisms? (Difficult)

16.Write the function of stomata. (Average)

17.What are vascular bundles? (Difficult)

18.Name the components of phloem. (Average)

19.Which substance is present in the cork of a tree that makes them impermeable to gases and water? (Easy)

20.What is the function of columnar epithelial tissue present in the inner lining of small intestine? (Average)

21. Bone tissue is said to be the strongest tissue. give reason (Difficult)

22.Write the specific function cardiac muscles. (Average)

23.What is nerve impulse? (Easy)

24.Name the tissue present in nose, ear and larynx. (Easy)

25.What is the function of columnar epithelial tissue present in the inner lining of small intestine? (Average)

III.Answer the following questions: (2 Marks)

26.How are simple permanent tissues different from complex permanent tissues? (Difficult)

27.Name the components of xylem tissue? Mention their function. (Average)

28.Write the differences between xylem and phloem. (Average)

29.what are the components of blood? (Easy)

30.Blood is considered to be necessary connective tissue in living beings. Justify. (Difficult)

31. Write the function of areolar tissue. (Easy)

32.Draw a neat labeled diagram of neuron. (Average)

IV.Answer the following questions: (3 Marks)

33.Differentiate between striated, unstriated and cardiac muscles on the basis of their structure and location/site in the body. (Difficult)

34.Draw a neat labeled diagram of phloem tissue. (Average)

V. Answer the following questions (4 Marks)

35.Name the following (Average)

a. Tissue that forms the inner lining of the mouth

b. Tissue that connects muscle to bone in humans

c.Connective tissue with a fluid matrix

d.Tissue present in the brain

7.Motion

Learning Outcomes:

Students are able:

1. Describe Motion
2. Distinguish Uniform Motion and Non uniform motion
3. Understand the Measuring Rate of Motion, Speed, Average speed, speed with direction, velocity, Average velocity, rate of change of velocity and acceleration.
4. Learn Graphical Representation of Motion
5. Understand Distance - Time Graph and Velocity Time Graph
6. Write Equations of Motion
7. Understand Uniform Circular Motion

Weightage according to difficulty level

Types	Easy	Average	Difficulty	Total
MCQ	3	3	2	08
VSA	7	4	2	13
SA 2M	1	3	2	06
SA 3M	1	0	2	03
SA 4M		1	----	1
Total	12	11	08	31

Weightage according to different types of objectives

Questions	Remembering	Understanding	Application	Skill	Total
M. C. Q	3	3	2	----	08
1Mark	5	6	2	------	13
2M	1	3	----	2	06
3M	1	------	-----	2	03
4M	-------	1	---	----	01
Total	10	13	4	4	31

I.**Four alternatives are given for each of the following questions /incomplete statements. Choose the correct alternative and write the complete answer along with its letter of alphabet. (1 Mark)**

1. The Change of Position with Time is (Easy)
   A. Motion
   B. Velocity
   C. Displacement
   D. Distance

2. The reference point to describe a motion is (Average)
   A. Point
   B. Origin
   C. Mark
   D. Place

3. The displacement of clock nail completes one rotation is (Difficult)
   A. 12 hours
   B. 1 hour
   C. Zero
   D. 1 day

4. The device that shows the distance travel of a vehicle is (Average)
   A. Barometer
   B. Hydrometer
   C. Lactometer
   D. Odometer

5. The formula to find speed is (Difficult)
   A. V=s/t
   B. s=v/t
   C. v= st
   D. t=v/s

6. An athlete moves in rectangular, hexagonal and circular path, the path creates accelerated motion is (Difficult)
   A. Rectangular
   B. Hexagonal
   C. Circular
   D. All of these

7. The following is not an equation of motion (Easy)
   A. V= u + at
   B. $v^2 = u^2 + 2as$
   C. $s = u t + ½ at^2$
   D. a= s + u t

8. The graph of the uniform motion shows (Easy)
   A. Straight line
   B. Zigzag line
   C. Circle
   D. Curved line

II. Answer the following questions: (1 Mark)

9. What is Motion? (Easy)
10. How can you Describe a Motion? (Average)

11. Which is the Simplest type of Motion? (Easy)
12. What is Distance Travel? (Easy)
13. Define Displacement. (Easy)
14. How the Odometer help in daily life? (Difficult)
15. An object moves a distance, is it has zero displacement? Give example (Difficult)
16. What is Uniform Motion? (Easy)
17. Give example for Non uniform Motion? (Average)
18. Define Speed. (Easy)
19. What is Velocity? (Easy)
20. Define Acceleration. Write its unit. (Average)
21. What is uniform circular motion? (Easy)

III. Answer the following questions: (2 Marks)

22. Differentiate between Distance travel and Displacement. (Average)
23. A car travels 20 m in 5 seconds and another 15m in 10 seconds. What is the average speed of car? (Difficult)
24. Distinguish between Speed and Velocity (Average)
25. Give example for Uniform and Non uniform Acceleration. (Average)
26. A bus decreases its speed from 80 km/hr to 60 km/hr in 5 sec. Find acceleration of bus. [Difficult]
27. Give example for uniform circular motion. (Easy)

IV. Answer the following questions (3 Marks)

28. Write equations of Motion with their indications. (Easy)
29. A body travel in semi-circular path of radius 10 m starting its motion from point A to point B. Calculate the distance and displacement. (Difficult)
30. A car starting from rest moves with uniform acceleration of 0.1 m/s2 for 4 min. Find the speed and distance travel. (Difficult)

V. Answer the following questions: (4 Marks)

31. A. Convert speed of 54 km/hr in to m/s (Average)
    B. Change speed of 6 m/s in to km/hr (Average)

    C. A driver decreases the speed of a car from 25 m/s to 10 m/s in 5 sec. Find the acceleration of car. (Average)

8.Force and laws of motion

Learning outcomes:

Students are able to

1.Define the meaning of force and differentiate balanced and unbalanced forces.
2.Explain first law of motion.
3.Relate inertia and mass.
4.Derive and formulate second law of motion.
5.Illustrate third law of motion.
6.Solve problems.

Weightage to different types and difficulty level

Types	Easy	Average	Difficulty	Total
MCQ	06	12	07	25
VSA(1M)	05	08	04	17
SA (2M)	04	06	03	13
LA(3M)	04	06	04	14
LA(4M)	01	02	01	04
LA(5M)	--	01	01	02
Total	20	35	20	75
Numerical	07	10	03	--
HOTS	--	02	02	04

Weightage to different objectives

Types	Remembering	Understanding	Application	Skill	Total
MCQ	07	09	07	02	25
VSA (1M)	05	07	03	02	17
SA (2M)	03	05	03	02	13
LA(3M)	03	06	04	01	14
LA(4M)	--	02	01	01	04
LA(5M)	--	01	01	--	02
Total	18	30	19	08	75

I.**Four alternatives are given for each of the following questions /incomplete statements. Choose the correct alternative and write the complete answer along with its letter of alphabet. (1 Mark)**

1.The friction of the object sliding on a given surface (Average)
A.increases with increase in weight
B.increases with decrease in weight
C.increases and decreases with weight
D. won't depend on weight

2.The ultimate outcome when balanced forces act upon an object (Easy)
A. The object remains stationary.
B. The object accelerates.
C. The object decelerates.
D.The object moves at a changing velocity.

3. The true statement/s about force is/are (Average)
A.Force is visible
B.Force can move a body
C.It can deform a body
D.both B and C

4. According to the first law of motion, an object persists in its state of rest or uniform motion unless influenced by (Easy)
A. Unbalanced forces.
B. Balanced forces.
C. Frictional forces.
D. Gravitational forces

5.The SI unit of force is (Easy)
A.$Kgm\text{-}^{s}$
B.Kgms
C.Newton-metre
D.Newton

6.A passenger in a moving train tosses a coin that falls behind him. It means that the motion of the train is (Easy)
A.uniform
B.accelerated
C.retarded
D.along circular tracks

7. A coin placed on a card (rested at the edges of the glass) remains at rest because of (Average)
A. frictional force
B. unbalanced force
C. No unbalanced force acts on it
D. frictional force or unbalanced force

8. The scenario best illustrates Newton's first law of motion is/are (Difficult)
A. A ball rolling down a hill.
B. A book sliding on a table stops after some time.
C. A person riding a bicycle at a steady pace.
D. A car accelerating after being at rest

9. The law of inertia is also named as (Easy)
A.Newton's first law of motion
B.Newton's second law of motion
C.Newton's third law of motion
D.Law of conservation of momentum

10.If two balls are dropped on sand, the depths of penetration is same if (Difficult)
A. Heavier ball is dropped faster than lighter ball
B. Lighter ball is dropped faster than heavier ball
C. The product 'mv' is same for both objects
D. A or B

11. A force of 50N moves an object, this describes that (Average)
A. Frictional force exerted on the object is less than 50N
B. Frictional force exerted on the object is more than 50N
C. A and B
D. A or B

12. Inertia embodies the resistance of an object to alterations in (Difficult)
A. Direction.
B. distance travelled.
C. acceleration.
D. direction and acceleration.

13. The inertia of an object causes the object to (Average)
A.decrease its speed
B.Increase its speed
C.resist any change in the state of its motion
D.decelerate due to friction

14. A fielder giving a swing while catching a ball is an example of (Average)
A. Inertia
B. Momentum
C. Newton's II law of motion
D. Newton's I law of motion

15. A football and a stone has same mass, then (Difficult)
A. Both have same inertia
B. Both have same momentum
C. Both have different inertia
D. Both have different momentum

16. The product of mass and velocity is (Easy)
A. Force
B. Inertia
C. Momentum
D. Acceleration

17.The rate of change of momentum of an object is directly proportional to (Average)
A. Mass of the object
B. Velocity of the object
C. Net force applied on the object
D. Acceleration of the object

18. If the mass of the object is doubled and its velocity becomes half, then the linear momentum of the object will (Difficult)
A.become double
B.remain the same
C.become half
D.become four times

19. In second law of motion, the acceleration of an object is directly proportional to (Average)
A. Its mass.
B. Its inertia.
C. The applied force.
D. None of the above.

20. The mathematical expression representing the second law of motion (Average)
A. $F = m \times a$.
B. $F = m / a$.
C. $F = m + a$.
D. $F = m – a$.

21. When a force of 10 N is applied to an object weighing 2 kg, the resultant acceleration of the object (Average)
A. 20 m/s^2.
B. 5 m/s^2.
C. 2 m/s^2.
D 0.2 m/s^2.

22. The linear momentum of an object is 250 gcm/s. If the velocity of the object is 5 m/s, then the mass of the object is (Difficult)
A.0.5 g
B.5 kg
C.0.5 mg
D.5 mg

23. A goalkeeper in a football game pulls his hands backwards after holding the ball shot at the goal. This enables the goalkeeper to (Difficult)
A.increase the rate of change of momentum
B.decrease the rate of change of momentum
C.increase the force exerted by the balls on the hands
D.exert larger force on the ball

24. The following is true for third law of motion (Average)
A.Action-Reaction pair always acts on the same objects.
B.They act on different objects in opposite directions
C.Action-Reaction pairs have the same magnitudes and directions
D.Act on either objects at normal to each other

25. If the action and reaction forces are equal in magnitude (Average)
A. produces the acceleration of equal magnitude.
B. won't produces the acceleration of equal magnitude.
C. produces the acceleration of equal and unequal magnitude.
D. produces the acceleration of equal or unequal magnitude.

II.Answer the following questions: (1Mark)

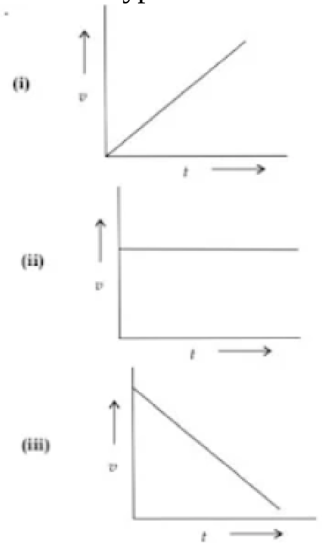
26.Define recoil velocity of a gun.(Average)
27.Name the force responsible for change in position or state of an object.(Easy)
28.Name the unbalanced force that slows down a moving bicycle, when we stop pedalling the bicycle.(Difficult)
29. Why does the sole of the shoe wear out?(Average)
30.When certain force is applied on an object, the mass of the object is doubled, then how does the acceleration of the object changes?(Difficult)
31.Why do bicycles begin to slow down when we stop pedalling?(Average)
32.Which law of motion gives the measure of force? (Easy)
33.What are the effects of force on an object?(Average)
34.Define one newton force.(Easy)
35.Define friction force.(Average)
36.What are the effects of balanced forces on an object?(Average)
37.Will the speed change, when an object moves on flat surface?(Difficult)
38.Do action and reaction act on the same object?(Easy)
39.What is the total momentum of a bullet and a gun before firing?(Difficult)
40.Name the principle on which a rocket works. (Easy)
41.An object is moving with uniform acceleration. Is its momentum constant? (Average)
42.Name the physical quantity that corresponds to the rate of change of momentum. (Average)

III. Answer the following questions: (2 Marks)

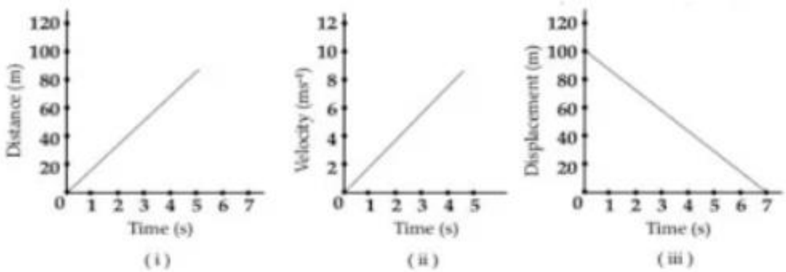
43.When a force acting on a object has equal and opposite reaction, then why should the object move? (Average)
44.What do you mean by a resultant force? (Easy)
45. Give two differences between balanced and unbalanced forces. (Average)
46.Two boys dropped sheets of paper from the top of the tower. One boy dropped his sheet of paper as such, while the other boy dropped it by changing it in the shape of a ball. Which sheet of paper will reach the ground first? Explain. (Assume air-resistance negligible). (Difficult)
47.Why is it easier to stop a tennis ball in comparison to a cricket ball moving with the same speed? (Average)
48.Does Newton's third law apply to a system, where objects do not actually not in contact? (Average)
49.On which factors does friction force depend? (Average)
50.Why can a small mass, such as a bullet kill a person when fired from a gun? (Easy)
51.Why does a boat tend to leave the shore, when passengers are alighting from it? (Difficult)
52.Describe our walking in terms of Newton's third law of motion. (Easy)
53.There are three solids made up of aluminium, steel and wood, of the same shape and same volume. Which of them would have highest inertia? (Average)
54.Two identical bullets are fired one by a light rifle and the other by a heavy rifle with the same force. Which rifle will hurt the shoulder more and why? (Difficult)
55.Water sprinkler used for grass lawns begins to rotate as soon as the water is supplied. Explain the principle on which it works. (Easy)

IV.Answer the following questions: (3 Marks)

56.i) While driving vehicles, how does the use of safety belts prevent accidents?
ii) Mention one situation to show that a body remains at rest unless acted upon by an unbalanced force. (Average)
57.Why does a cricket player moves his hand backward while catching the ball? (Average)
58.What type of force is acting in the cases given below ? (Easy)



59.A bullet fired against a glass window pane makes a hole in it, and the glass pane is not cracked. But on the other hand, when a stone strikes the same glass pane, it gets smashed. Give reason.(Average)
60. Give few examples for Newton's third law of motion.(Average)
61.Two friends on roller-skates are standing 5 m apart facing each other. One of them throws a ball of 2 kg towards the other, who catches it? How will this activity affect the position of the two? Explain your answer. (Difficult)
62.Why does an athlete puts some sand or cushion on the ground while high jumping? (Difficult)
63.Why do the driver and the person seated in front seat need a seat belt?(Difficult)
64.Describe Newton's third law of motion.(Easy)
65. Derive Newton's first law of motion from the mathematical expression of the second law of motion.(Difficult)
66.(i) It is possible that the train in which you are sitting appears to move while it is at rest? Justify your answer.
ii) Can the train appear to be at rest while moving? Justify your answer.(Easy)
67. What are the effects of the following on inertia of a body?(Difficult)
(i) If force is doubled
(ii) If density is halved
(iii) If volume is reduced to one third.
68.Define SI unit of force. A force of 2N acting on a body changes its velocity uniformly from 2 m/s to 5m/s in 10s. Calculate the mass of the body.(Average)
69.What type of motion is represented by each of the following graphs?(Easy)



V.Answer the following questions: (4 Marks)

70.Describe balanced forces with help of two examples. (Average)
71.Define inertia. What are the different types of inertia? Give two examples in each case. (Easy)
72.A force of 5N produces an acceleration of 8 ms^{-2} in mass m_1, and acceleration of 24ms^{-2} is mass m_2. If both are tied together, find the acceleration? (Difficult)
73. Mention various forces acting on the heavy stone, when a small boy tries to push the heavy stone. (Average)

VI. Answer the following questions: (5 Marks)

74.(i) Define momentum. Write its S.I. unit.
(ii) An object of mass 10kg falls from a height of 5 m ,find the momentum of the object on the floor. (g =10 ms^{-2}).
(iii) Explain how a karate player can break a pile of tiles with a single blow of his hand. (Average)
75.(i) Two objects of masses 100 g and 200 g are moving along the same line and direction with velocities of 2 ms^{-1} and 1 ms^{-1} respectively. They collide and after the collision, the first object moves at a velocity of 1.67 ms^{-1}. Determine the velocity of second object.
(ii) If a man jumps out from a boat, the boat moves backwards. Why? (Difficult)

VII.Numerical problems

1.A bullet of 10 g strikes a sand bag at a speed of 10^3 ms^{-1} and gets embedded after travelling 5 cm. Calculate
(i) the resistive force exerted by the sand on the bullet.
(ii) the time taken by the bullet to come to rest. (3m) (Difficult)
2.A body of mass 300 g kept at rest breaks into two parts due to internal forces. One part of mass 200 g is found to move at a speed of 12 m/s towards the east. What will be the velocity of the other part?(2m) (Average)
3.A force of 10 N produces an acceleration of 12 ms^{-2} on a mass m_1 and an acceleration of 24 ms^{-2} on a mass m_2. What acceleration would the same force provide if both the masses are tied together? (2m) (Easy)
4.A bullet of mass 4 g fired with a velocity of 50 ms^{-1},can enter a wall up to a depth of 10 cm. Find the average resistances offered by the wall.(2m) (Average)
5.Calculate the acceleration produced by a force of 12 N exerted on an object of mass 3 kg. (2m) (Easy)
6.A cracker of mass 100 g explodes into two pieces of equal mass. Show that these two pieces of the cracker fly in opposite direction.(3m) (Difficult)
7.An iron sphere of mass 1 kg is dropped from a height of 10 m. If the acceleration of sphere is 9.8 ms^{-2}, calculate the momentum transferred to the ground by the ball.(2m) (Average)
8.A bullet of mass 0.02 kg is fired from a gun weighing 7.5 kg. If the initial velocity of the bullet is 200 m/s, calculate the speed with which the gun recoils.(1m) (Easy)
9.A man throws a ball of mass 0.4 kg vertically upwards with a velocity of 10 m/s. Find its initial momentum, and final momentum when it reaches the highest point .(2m) (Average)
10.Which situation would require a greater force—accelerating a 2 kg mass at 5 ms^{-2} or a 4 kg mass at 2 ms^{-2} ?(2m) (Difficult)
11. Two objects with a mass of 1.5 kg each move in the same straight line but in opposite directions. The speed of each object is 2.5 ms^{-1} before the collision during which they stick together. Find the speed of the combined object after the collision.(3m) (Average)
12. A hockey ball of 200 g mass, moving at 10 ms^{-1} is hit by a hockey stick to return to its original path at a speed of 5 ms^{-1}. Calculate the change in momentum of the hockey ball . (3m) (Average)
13. An object of mass 5kg takes off and rolls down on an inclined plane of length 32m in 4s. Find the force acting on the body.(3m) (Easy)

14.An object with a mass 100 kg accelerates smoothly from a speed of $5ms^{-1}$ to $8ms^{-1}$ in 6s. Calculate the initial and final momentum of the object. Also, find the magnitude of the force being exerted on the object.(3m) (Difficult)

15.Find the momentum of a frame of mass 200g shifting with a speed of 15ms−1?(1m)

16.A pressure of 25N acts on a mass of 500g resting on a frictionless surface. calculate the acceleration produced.(2m) (Easy)

17.A hockey ball of mass 200 g and moving at 10 ms^{-1} , is hit by a hockey stick, so that it returns to its original path with a speed of $5ms^{-1}$. Calculate the magnitude of the change in momentum in the motion of the hockey ball due to the force exerted by the hockey stick.(3m) (Difficult)

18.A projectile of 10 g moving horizontally at $150ms^{-1}$ speed ,hits a stationary block of wood and stops in 0.03 s. Calculate the penetration distance of the bullet into the block. Also, calculate the force of block of wood exerts on the ball.(4m) (Average)

19.A truck starts from a standing start and rolls downhill with constant acceleration. It covers a distance of 400 m in 20 s. Find its acceleration. Find the force acting on it when its mass is 7 tons (hint: 1 ton = 1000 kg.(4m) (Easy)

20. A bullet with a mass of 50 g is fired from a gun with a mass of 4 kg with an initial velocity of 35 m s^{-1}. Calculate the rifle's initial recoil velocity.(2m) (Difficult)

VIII.HOTS (Higher Order Thinking Skills)

1.Why does an athlete run a certain distance before taking a leap? (1m) (Average)

2.Two balls made of rubber and iron with same size , are kept on the smooth floor of a moving train. The brakes are applied suddenly to stop the train. Will the balls start rolling? If so, in which direction? Will they move with the same speed? Give reasons for your answer. (4m) (Difficult)

3.Does it mean that, no force is acting on the object if it is not moving?(2m) (Average)

4.A horse continues to apply a force in order to move a cart with a constant speed. Explain why? (2m) (Difficult)

Note : The alphabetical letters in the brackets at the end of each question, represents the type and objective of that question

PART-2

3. Atoms and molecules

Learning outcomes:

Students are able to

1. Define the law of Conservation of Mass.
2. Define the law of definite proportion.
3. Identify the symbol of atoms, ions and molecules.
4. Explain the atomic mass and method of calculating atomic mass.
5. Explain the concept of chemical formula

Weightage according to difficulty level

Types	Easy	Average	Difficult	Total
MCQ	3	4	1	8
VSA (1 M)	6	8	1	15
SA (2 M)	4	3	1	8
LA (3 M)	2	2	1	5
LA (4 M)	-	1	2	3
Total	15	18	6	39

Weightage according to different objectives

Questions	Remembering	Understanding	Application	Skill	Total
MCQ	04	03	-	1	08
VSA(1 M)	03	08	3	1	15
SA (2 M)	01	03	2	2	08
LA(3 M)	01	02	1	1	05
LA(4 M)	-	01	1	1	03
Total	09	17	7	6	39

I. Four alternatives are given for each of the following questions /incomplete statements. Choose the correct alternative and write the complete answer along with its letter of alphabet. (1 Mark)

1. The molecular formula of Sodium chloride (Easy)
   A. NaCl
   B. NaOH
   C. HCl
   D. KCl

2. The molecular formula of Potassium nitrate (Easy)
   A. KON
   B. KNO_2
   C. KNO_3
   D. NaCl

3. The Scientist who proposed the law of constant proportions (Easy)

A. J.J Thomson
B. Lavoisier
C. Joseph L proust
D. Dalton

4. The valency of Aluminum in the compound $Al(OH)_3$ (Difficult)

A. 1
B. 2
C. 3
D. 4

5. Name of the compound representing the formula CaO (Average)

A. Calcium oxide
B. Calcium carbonate
C. Calcium chloride
D. Calcium hydroxide

6. The element having mono atomicity (Average)

A. Oxygen
B. Hydrogen
C. Helium
D. Nitrogen

7. The element having Tetra atomicity (Average)

A. Oxygen
B. Phosphorus
C. Helium
D. Nitrogen

8. Which of the following is not a Di-atomic element? (Average)

A. Oxygen
B. Hydrogen
C. Chlorine
D. Sulphur

II. Answers the following questions: (1 Mark)

9. Define the law of conservation of mass. (Average)
10. Define the law of constant proportion. (Average)
11. What is meant by a molecule? (Easy)
12. What is an ion? (Easy)
13. Define atomicity. (Easy)
14. Give an example each for cation and anion. (Easy)

15. Define valency. (Average)

16. What is the valency of oxygen atom? (Average)

17. Write the molecular formula of hydrogen chloride. (Easy)

18. Write the atomic symbol for Iron and Sodium. (Easy)

19. Why is not possible to see an atom with naked eyes? (Difficult)

20. Which postulate of Dalton's atomic theory is the result of the law of conservation of mass? (Average)

21. Which postulate of Dalton's atomic theory can explain the law of definite proportions? (Average)

22. What is the atomicity of Argon? (Average)

23. What is meant by the term chemical formula? (Average)

III. Answers the following: (2 Marks)

24. Name the scientists whose experimentation established laws of chemical combination and state the laws also. (Easy)

25. Define the law of conservation of mass and law of constant proportion. (Average)

26. The ratio of mass of Hydrogen and oxygen to form water is 1:8. What mass of oxygen gas would be required to react completely with 3 gram of hydrogen gas? (Difficult)

27. Write the chemical formulae of . (Average)

a) Magnesium chloride

b) Hydrogen chloride

c) Sodium carbonate

d) Calcium hydroxide

28. What are polyatomic ions? Give examples. (Easy)

29. What is an ion? Name its types with examples. (Easy)

30. Name the elements present in the following compounds. (Easy)

a) Calcium hydroxide

b) Hydrogen chloride

c) Sodium chloride

d) Potassium Sulphate

31. Calculate the molar mass of H_2O and HNO_3. (Average)

(atomic mass of H= 1, atomic mass of O = 16, atomic mass of N = 14)

IV. Answers the following questions: (3 Marks)

32. Write the correct symbol of the following - (Easy)

a) FE (Iron) b) AL (Aluminium) c) CO (Cobalt)

d) AG (Silver) e) NA (sodium) f) AR (Argon)

33. What are ions? Give an example for poly atomic cation and anion. (Average)

34. What is formula unit mass? Calculate the formula unit mass of NaCl, (atomic mass of Na = 23u, atomic mass of Cl = 35.5u). (Difficult)

35. What are the rules to be followed while writing chemical formula? (Average)

36. Answer the following. (Easy)

a. Write the chemical symbol of the elements Nitrogen and Fluorine.

b. Write the symbols of two elements which have been taken from Latin language and mention their names.

c. Give two examples for the elements which are written with first two letters.

V. Answers the following: (4 Marks)

37. a) If the valency of the element 'X ' is 4 and the another element ' Y ' is 1, then write the chemical formula of the compound formed by the combination of these two elements.

b) If the valency of the element 'X ' is 2 and the another element ' Y ' is 2, then write the chemical formula of the compound formed by the combination of these two elements. (Difficult)

38. Write the formulae of the following. (Average)

a) Sodium oxide

b) Sodium sulphide

c) Magnesium hydroxide

d) Calcium hydroxide

39. 5.0 g of Magnesium oxide is produced when 3.0 g of magnesium is burnt in 2.0 g of oxygen. Calculate the mass of Magnesium oxide formed when 3.00 g magnesium is burnt in 5.0 g of oxygen. On which law of chemical combination is your answer based? (Difficult)

4. Structure of atom

Learning outcomes:

1. List the charged particles present in an atom, the postulates and drawbacks of various models of atom how other scientist overcome them, use of various isotopes in their day to day life.
2. Appreciate the contributions made by the scientist who discovered protons neutrons and electrons, explain how they conducted simple experiments, illustrate how the scientist discovered these particles and draw conclusions out of the experiments made from scientist.
3. Differentiate protons, neutrons and electrons based on characteristics.
4. Identify when these particles were discovered, the number of electrons present in the outermost shell,
5. Define the terms like Canal Ray, isotopes and isobars, atomic number and mass number.
6. Draw diagrams of Thomson and Bohr's model of atom.
7. Give reasons and justify for various aspects like the position of protons, neutrons and electrons, for why certain elements loose or gain electrons, why the atomic mass number of certain elements are in decimals.
8. Mention the rules followed to write electronic configuration
9. Write electronic configuration for different elements.
10. Calculate the valencies of different elements.
11. Identify symbol, atomic number, mass number, number of protons neutrons and electrons for the given element.
12. Give examples for inert gases, positive and negative ions, isotopes and isobars
13. Distribute the electrons in various shells and abbreviate the symbolic representation of element.
14. Calculate the atomic number, mass number, number of neutrons, protons or electrons from by using formula.
15. Compare atomic number and mass number.

Weightage according to difficulty level

Types	Easy	Average	Difficulty	Total
MCQ	10	10	02	22
VSA (1M)	01	07	08	16
SA(2M)	03	04	03	10
LA(3M)	03	04	02	09
LA(4M)	01	02	01	04
LA(5M)	00	02	00	02
Total	18	29	16	63

Weightage according to Objectives

Questions	Remembering	Understanding	Application	Skill	Total
MCQ	10	8	2	2	22
VSA (1M)	3	6	5	2	16
SA(2M)	3	2	2	3	10
LA(3M)	2	3	2	2	09
LA(4M)	1	1	1	1	04
LA(5M)	-	1	-	1	02
Total	19	21	12	11	63

I.**Four alternatives are given for each of the following questions /incomplete statements. Choose the correct alternative and write the complete answer along with its letter of alphabet. (1 Mark)**

1. The first person to propose a model for structure of an atom is (Easy)
   A. Dalton
   B. Neils Bohr
   C. J J Thomson
   D. Rutherford

2. E. Goldstein in 1886 discovered the presence of new radiations in a gas discharge tube and called them (Average)
   A. Cathode Ray
   B. Canal Ray
   C. Alpha Ray
   D. Neutral Ray

3. Which atomic theory stated that atom is indivisible (Easy)
   A. Dalton
   B. J J Thomson
   C. Rutherford
   D. Neils Bohr

4. The mass of proton is approximately this times as that of electron (Difficult)
   A. 1000
   B. 2000
   C. 10000
   D. 20000

5. The mass of proton is taken as (Easy)
   A.1 unit
   B. 2 unit
   C. 3 unit
   D. 4 unit

6. Christmas pudding model or watermelon model was given by (Easy)
   A. Dalton
   B. J J Thomson c
   C. Neils Bohr
   D. Rutherford

7. In Alpha scattering experiment fast moving Alpha particles were made to fall on a thin foil of (Easy)
   A. Gold
   B. Silver
   C. Copper
   D. Iron

8. The mass of Helium atom is (Average)
   A. 1u
   B. 2u
   C. 3u
   D. 4u

9. In Rutherford experiment most of the Alpha particles passed through gold foil (Average)
   A. deflected in small angles
   B. deflected in large angles
   C. password straight without deflection
   D. deflected by 180°

10. Very small fraction of Alpha particles were deflected by 180° indicating that the mass of gold atom were concentrated in a very small volume within the atom and are charged (Average)
   A. positive
   B. negative
   C. neutral
   D. randomly

11. Radius of the nucleus is about _____ times less than the radius of the atom (Average)
   A. 10^3
   B. 10^4
   C. 10^5
   D. 10^6

12. Rutherford alpha scattering experiment was the first to showed the presence of this in an atom (Easy)
   A. neutron
   B. Proton
   C. electron
   D. nucleus

13. Any particle in a circular orbit would undergo (Average)
   A. inertia
   B. acceleration
   C. Momentum
   D. change in state.

14. The maximum electrons that can be accommodated in outermost orbit in octate state is (Easy)
   A. 2
   B. 8
   C. 18
   D. 32

15. If Z=6, the valency of the element is (Average)

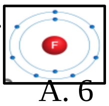
A. 1
B. 2
C. 3
D. 4

16. The electrons present in the outermost shell of an atom are known as (Easy)

A. valence electrons
B. inert electrons
C. ideal electrons
D. zero electrons

17. The particles which revolve around the nucleus in circular path are (Easy)

A. protons
B. neutrons
C. electrons
D. positrons

18. 

The number of electrons present in the outermost shell of this atom is (Average)

A. 6
B. 7
C. 8
D. 5

19. The isotope used as a fuel in nuclear reactor is (Average)

A. Carbon
B. Cobalt
C. Iodine
D. Uranium

20. If atomic number of an element is 31 and mass number is 15. The number of electrons, protons and neutrons respectively in it are (Difficult)

A. 15, 16, 15
B.16, 15, 15
C. 15, 15, 16
D. 31, 15, 15

21.The positively charged center in an atom (Easy)

A. proton
B. neutron
C. electron
D. nucleon

22. Which of the following classes of elements differ in their chemical properties (Average)

A. allotropes
B. isotopes
C. isobars
D. allotropes and isotopes

II. Answer the following questions: **(1Mark)**

1. Name the three fundamental particles found in an atom? (Easy)
2. If K and L shell of an atom are filled, then what would be the total number of electrons in the atom? (Average)
3. What is the similarity in the electronic configuration of lithium, Sodium and potassium? (Average)
4. How many protons and neutrons are present in the element $_9X^{19}$? (Difficult)
5. What is the number of valence electrons present in Oxide ion (O^{2-})? (Difficult)
6. If the L shell of an element has 5 electrons. Write the electronic configuration and name the element? (Average)
7. Protons are called Canal rays. Why? (Average)
8. The composition of the nuclei of two atomic species X and Y is given as under

	X	Y
Protons	4	5
Neutrons	5	5

Give the mass numbers of X and Y. (Difficult)

9. Among H^+ and H^- which one has a single electron in its outermost shell. (Difficult)
10. What will be the charge on an ion formed by an atom which has 7 Valence Electrons? why. (Difficult)
11. What is the maximum number of electrons present in the N- shell of an atom? (Difficult)
12. Element has two electrons and two protons, what is its charge? Justify your answer. (Difficult)
13. Write the mass number of the isotope of an element $_zX^A$ Which has two excess neutrons. (Average)
14. A uni negative Ion contains 18 electrons. What will be its atomic number? (Average)
15. What is the atomic number of a species which contains 20 protons 20 neutrons and 18 electrons? (Difficult)
16. What will be the valency of all the isotopes of an element? (Average)

III. Answer the following questions: **(2 Marks)**

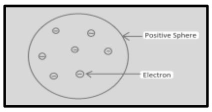
1. Write one use of the following isotopes in medicinal field (Easy)
   a. Cobalt
   b. Iodine
2. State the postulates put forward by Neils bohr in order to overcome the objections raised against to the Rutherford model of atom? (Difficult)
3. The total number of nucleons in in the atom of Calcium and Argon is 40 and the atomic number of calcium and Argon are 20 and 18 respectively. Name the pair of these two elements and also find out the number of neutrons present in the nucleus of Argon atom. (Average)
4. What are inert gases? give example. (Easy)
5. Mention the steps you follow as a student to distribute the electrons in different orbits. (Difficult)
6. What observations in scattering experiment led the Ruther ford to give the following postulates? (Difficult)
   a. most of the space in an atom is empty.
   b. positive charge of an atom occupies very little space.
7. Illustrate an experiment you perform to show that atoms are made up of charged particles. (Average)
8. Name four scientists who worked hard to discover the model of the structure of an atom. (Average)
9. Based on the Bohr atomic model, write a model of the structure of a calcium atom and label the parts. (Average)
10. What are isotopes? Name the isotopes of hydrogen. (Easy)

IV. Answer the following questions: (3Marks)

1. Based on the number of protons, neutrons and electrons in the samples of the table given below, identify the pairs of (Difficult)

a. Cation (positive ion)
b. Isobar pairs
c. Isotope pairs.

Samples	otons	Neutrons	Electrons
A	6	6	6
B	18	22	18
C	20	20	20
D	13	14	10
E	6	8	6

2. The atomic number of element 'X' is 27 and it has 13 protons. (Average)
a. Write the symbol for this element.
b. Find the number of neutrons and electrons in this element.
c. Write the electronic configuration of this element.
3. Write any two characteristics of protons, neutrons and electrons? (Easy)
4. Calculate the valency of (Average)
a. Nitrogen (z=7)
b. Neon (z=10)
c. Magnesium (z=12).
5. 

Who proposed this model of an atom? State the postulates proposed by him? (Average)
6. Write the symbol, atomic number, atomic mass number, number of protons, neutrons and electrons present in the element of Potassium. (Difficult)
7. Name the year and the scientist who discovered the following sub atomic particles.(Easy)
a. Proton
b. Neutron
c. Electron
8. List the results or observations made by Rutherford in his alpha particle scattering experiment. (Average)
9. Explain Rutherford's nucleus model of an atom. (Easy)

V. Answer the following questions: (4MArks)

1. Give scientific reasons for the following: (Average)
a. Isotope of an element are chemically similar.
b. An atom is electrically neutral
c. Noble gases show least reactivity.
d. Ions are more stable than atoms.
2. Name the following: (Easy)
a. The number of protons in an atom.
b. Atoms of the same element with the same atomic number but different atomic mass numbers.
c. The phenomenon in which atoms of different elements with different atomic numbers have the same atomic mass.
d. The total number of protons and neutrons in the nucleus of an atom.
3. The atomic mass number of chlorine is 35.5u. Justify with suitable reason. (Difficult)
4. Write the schematic atomic structure of the atom of the elements given below. (Average)
a. Sodium (z=11)
b. Oxygen (z=8)

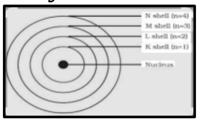
c. Carbon (z=6)
d. Chlorine (z=17).

VI. Answer the following questions: (5 Marks)

1. a. How did Rutherford prove that positively charged particles are in the nucleus? (Average)

b. What are the drawbacks of Rutherford's atomic model?

c. Why did Rutherford choose gold foil for this experiment?

2. 

a. Name the scientist who proposed this atomic model. (Average)

b. State the postulates of this atomic model.

c. What is the maximum number of electrons that an M-shell can hold?

8. Gravitation

Learning outcomes:
Students are able to:

1. Know the concept of gravity and universal law of gravitation.
2.Understand the objects in free fall and acceleration due to gravity.
3.Apply the laws of motion on free falling bodies.
4.Explain the difference between mass and weight.
5.Understand the concepts of thrust pressure and buoyancy.

Weightage according to difficulty level

Questions	Easy	Average	Difficult	Total
MCQ	1	3	1	5
1 mark questions	5	1	--	6
2 mark questions	--	3	3	6
3 mark questions	1	--	1	2
4 mark questions	--	1	1	2
5 mark questions	--	2	--	2
Total	7	10	6	23

Weightage according to objectives

Questions	Knowledge	Understanding	Application	Skill	Total
MCQ	1	3	1	--	5
1 mark questions	3	2	1	--	6
2 mark questions	--	5	1	--	6
3 mark questions	--	1	1	--	2
4 mark questions	--	1	1	--	2
5 mark questions	--	1	1	--	2
Total	4	13	6	--	23

I. Four alternatives are given for each of the following questions /incomplete statements. Choose the correct alternative and write the complete answer along with its letter of alphabet. (1 Mark)

1)SI unit of pressure is (Easy)
A. Newton
B. Joule
C. Watt
D. Pascal

2)The acceleration due to gravity on the moon is (Average)
A. Equal to earth
B. Less than the earth
C. Greater than the earth
D. Zero

3) The value of gravitational constant(G) is (Difficult)
A. 6.673×10^{-11} Nm^2 kg^{-2}
B. 66.73×10^{-11} Nm^2 kg^{-2}
C. 6.673×10^{-13} Nm^2 kg^{-2}
D. 66.73×10^{-13} Nm^2 kg^{-2}

4)Mass of an object, in various situations is always (Average)
A. increases
B. different
C. same
D. decreases

5)If coin and feather allows to free fall in vacuum, then (Average)
A. Coin reaches earth first
B. Feather reaches earth first
C. Feather not reaches the earth.
D. Both reaches at a time

II. Answer the following questions (1 Mark)

6)Define gravity. (Easy)
7)What is buoyancy? (Easy)
8)Define pressure. (Easy)
9)What is the average value of acceleration due to gravity on the earth? (Easy)
10)Give an example for free falling objects in our daily life. (Easy)
11) Can we consider sky diving as free fall? (Average)

III. Answer the following questions (2 Marks)

12)Define universal law of gravitation. (Average)
13)Write difference between mass and weight. (Difficult)
14)Define Archimede's principle. (Average)
15)What are the factors affecting the gravitational force between two objects? (Average)
16)Explain the value of acceleration due to gravity 'g' is different at poles and equator of earth. (Difficult)
17)Which force will apply on free falling objects. Can we escape from free fall if we have negligible mass, if no, give reason? (Difficult)

IV. Answer the following questions: (3 Marks)

18)What is the importance of universal law of gravitation? (Easy)

19)Calculate the gravitational force between two objects of mass 20kg and 30kg separated by 2m .Given that $G = 6.673\times10^{-11}\ Nm^2\ kg^{-2}$ (Difficult)

V. Answer the following questions: (4 Marks)

20)A car falls of a ledge and drops to the ground in 0.4s, let $g = 10ms^{-2}$ (Difficult)

a) What its speed on striking ground?

b) What its average speed during the 0.4s?

c)How high is the ledge from ground?

21)Calculate the value of acceleration due to gravity 'g' on the earth by using universal law of gravitation. ($G=6.673\times10^{-11}\ Nm^2\ kg^{-2}$ Mass of the earth = 6×10^{24} kg, radius of the earth = 6.4×10^{6} m) (Average)

VI. Answer the following questions: (5 Marks)

22)A block wood is kept on a table top. The mass of wooden block is 6kg and its dimensions are 50cm×30cm×20cm. Find the pressure exerted by the wooden block on the tabletop if it is made to lie on the table top with its sides of dimensions a)30cm×20cm b)50cm×30cm . (Average)

23)Explain Archimedes' principle with an experiment and write its applications. (Average)

10.Work and energy

Learning outcomes

Students are able to

1. Understand and explain the scientific concept of work.
2. Differentiate between positive and negative work.
3. Define ‘Power’.
4. List the sources and various forms of energy.
5. Define kinetic energy in scientific and mathematical terms.
6. Define potential energy scientific and mathematical terms.
7. Differentiate between kinetic energy and potential energy with examples.
8. Explain the law of conservation of energy and understand its importance in everyday processes.
9. Explain the rate or capacity of work done
10. Calculate problems on work, kinetic energy, potential energy and capacity.

Weightage according to difficulty level

Questions	Easy	Average	Difficult	Total
MCqs	4	3	--	7
1 Mark	7	5	2	14
2 Marks	2	5	3	10
3 Marks	1	1	2	4
Total	14	12	9	35

Weightage according to Objective

Questions	Remembering	Understand	Application	Skill	Total
MCqs	2	5	--	--	7
1 Mark	6	6	2	--	14
2 Marks	2	1	7	--	10
3 Marks	--	2	2	--	--
Total	10	14	11	--	35

I.**Four alternatives are given for each of the following questions /incomplete statements. Choose the correct alternative and write the complete answer along with its letter of alphabet. (1 Mark)**

1. The SI unit of work or energy (Easy)
   A. Watt
   B. Newton
   C. ohm
   D. joule

2. Energy change in electric cell (Average)
   A. Electrical energy to mechanical energy.
   B. Electrical energy to chemical energy
   C. Energy from chemical
   D. Chemical energy to electrical energy

3. Work done if a force is applied in the direction of displacement of a body (Average)
   A. Is positive
   B. Is negative
   C. Is zero
   D. Is even

4. A force extended on a body, that helps body move in the direction of the force (Average)
   A. Increases the kinetic energy of the object
   B. Decreases the kinetic energy of the object
   C. Increases the tensile strength of the material
   D. Decreases the tensile strength of the material

5. Total sum of potential energy and kinetic energy (Easy)
   A. Chemical energy
   B. Mechanical energy
   C. Thermal energy
   D. Nuclear energy

6. According to law of conservation of energy "Energy can either be created or be destroyed" during conversation of energy (Easy)
   A. Law of universal gravitation
   B. Newton's law of motion
   C. Law of conservation of energy
   D. None of the above

7. 1kWh = (Easy)
   A. 36×10^6 J
   B. 3.6×10^6 J
   C. 3.6×10^9 J
   D. 36×10^9 J

I. **Answer the following questions:** **(1 Mark)**

8. Write two conditions that state work has been done. (Average)
9. Write an expression for the work done on a body when a force is applied in the direction of its displacement. (Average)
10. Define 1 joule work. (Easy)
11. Is there any displacement when no forces act on a body, justify the answer with suitable reason? (Average)
12. Even though many forces act on a body, its acceleration is zero. Do you agree with the statement? Justify with suitable reason. (Difficult)
13. What is energy state the SI unit of energy? (Difficult)
14. What are the different forms of energy? (Easy)
15. Describe the different types of energy changes that occur when you pedal a bicycle. (Average)

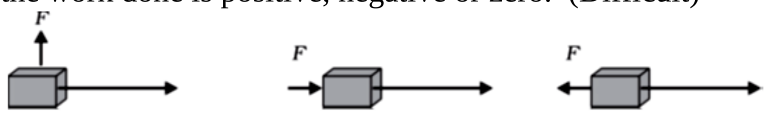
16. In all your failed attempts at pushing a huge boulder, was energy transferred? Where did the energy you exert go? (Average)
17. Define 1-watt capacity. (Easy)
18. What is capacity? Write the expression form of capacity. (Easy)
19. What is average strength? (Easy)
20. What is commercial unit of energy? (Easy)
21. How much work is done due to gravitational force on a satellite orbiting the earth? Justify the answer with suitable reason. (Difficult)

II. **Answer the following questions:** **(2 Marks)**

22. A man is tired after carrying a load of hay on his head for 30 minutes. Has he done any work. Justify your answer. (Difficult)
23. A force of 7N acts on a body, its displacement in the direction of the force is 8m. Let us take this as the force acting on the body throughout the displacement. Calculate the amount of work done. (Average)
24. A pair of oxen exerts a force of 140N on a plough. The land to be ploughed in 15m long. Calculate the work done in ploughing the length of land? (Average)
25. What is kinetic energy? Write the expression that describes kinetic energy. (Easy)
26. A freely falling body finally reaches the ground and stops. What is its kinetic energy? (Average)
27. A body of mass 15kg is moving at a constant speed of 4m/s. how much kinetic energy does the body possess? (Average)
28. What is potential energy? Write the expression that describes potential energy. (Easy)
29. If a body of mass 10kg is at a height of 6m from the ground, calculate the potential energy of the body (given: g=9.8ms-2) (Difficult)
30. An electric bulb consumes 100 J of electric energy in 10 seconds. Calculate its capacity. (Average)
31. A 60W bulb is used for 6 hours in a day. Find the power consumed by the bulb in one day in units. (Difficult)

III. **Answer the following questions:** **(3 Marks)**

32. Classify the following into potential energy and kinetic energy:
    a. Flowing water, pressed spring, moving bus, a stretched rubber band, an arrow shot from a bow, a stone on the top of building. (Easy)
33. As a freely falling body continues its kinetic energy decreases. Does this violate the law of conservation of energy? Justify your answer with suitable reason. (Difficult)
34. In each of the following a force ‘F’ acts on a body of mass ‘M’. the direction of displacement is from west to east as shown by the long arrow. Observe the pictures carefully and determine whether the work done is positive, negative or zero. (Difficult)



35. A boy with a mass of 50kg climbs 45 steps leading to a floor in 9 seconds. If the height of each step is 15 cm, find his capacity ($g=10ms^{-2}$). (Average).

11. Sound

Learning outcomes:

Students are able to:

1 Explain the mode of sound production in humans.
2. Differentiate between longitudinal and transverse waves.
3. Define the characteristics of sound waves like Frequency, Wave length, Amplitude, Time period and Speed.
4. Understand the SI units of Frequency,Wave length,Time period and Speed of sound.
5. Differentiate between Tone and Note, Echo and Reverberation, Ultrasonic sound and Infrasonic sound.
6. Understand the speed of sound in different media.
7. Solve the problems based on sound.
8. List out the applications of multiple reflection of sound.
9. Explain the techniques of Echo Cardiography and Ultrasonography.

Weightage according to objectives

Types of Questions	Remembering	Understanding	Applications	Skill	Total
MCQ	04	06	-	-	10
VSA (1M)	06	05	-	-	11
SA (2M)	03	03	-	-	06
LA (3 M)	-	02	01	02	05
LA (4 M)	-	03	01	-	03
Total	13	18	02	02	35

Weightage on Difficulty level

Types of Questions	Easy	Average	Difficult	Total
MCQ	02	04	04	10
VSA (1M)	04	04	03	11
SA (2M)	03	02	01	06
LA (3 M)	-	02	03	05
LA (4 M)	-	02	01	03
Total	09	14	12	35

1. Four alternatives are given for each of the following questions /incomplete statements. Choose the correct alternative and write the complete answer along with its letter of alphabet. (1 Mark)

1. Sound is produced by objects through (Easy)
   A. Motion
   B. Behaviour
   C. Vibration
   D. Resonance
2. In humans, sound is produced by the vibration of (Easy)
   A. Vocal cords
   B. Vocal strings
   C. Optic fibres

D. Muscle fibres

3. In a medium, the ………… generated by the source of sound travels through the medium. (Average)
   - A.Motion
   - B. Disturbance
   - C. Behaviour
   - D. Vibration
4. Sound waves are examples of (Difficult)
   - A. Transverse waves
   - B. Horizontal waves
   - C. Longitudinal waves
   - D. Seismic waves
5. To hear an echo, the minimum distance between the obstacle and the source is. (Difficult)
   - A. 17.2m
   - B. 172m
   - C. 1.72m
   - D. 0.172m
6. Audible range of sound in humans. (Difficult)
   - A. 20KHz – 20,000KHz
   - B. 20Hz – 20,000Hz
   - C. 20KHz – 40KHz
   - D. 20KHz – 30KHz
7. Sound waves do not travel through. (Average)
   - A. Solids
   - B. Liquids
   - C. Gases
   - D. Vaccum
8. Music concert halls should have one of the following properties. (Difficult)
   - A. Reflect sound
   - B. Transmit sound
   - C. Spread sound
   - D. Absorb sound
9. The sensation of sound persists in our brain for about. (Average)
   - A. 0.1 second
   - B. 0.5 second
   - C. 0.8 second
   - D. 0.3 second
10. A hearing aid is an electronic device that operates using (Average)
    - A. Solar power
    - B. Dry cell
    - C. Electric power
    - D. Microphone

II Answer the following questions: (1Mark)

11. What is a medium ? (Average)
12. What is a wave? (Easy)
13. What is vibration? (Easy)
14. What is wave length? (Average)
15. Define frequency of a wave. (Easy)
16. What is time period of a sound wave? (Difficult)

17. What is pitch? (Difficult)
18. What is the amplitude of a wave? (Average)
19. What is the speed of sound wave? (Difficult)
20. What is an Echo? (Easy)
21. Define Reverberation?. (Average)

III Answer the following questions: (2Marks)

22. Differentiate between Transverse waves and longitudinal waves. (Difficult)
23. Write the SI units for the following. (Easy)
    a. Wavelength
    b. Time period
    c. Frequency
    d. Speed of wave
24. Define the following: (Average)
    A. Tone
    B. Note
25. Differentiate between music and noise. (Easy)
26. Differentiate between Ultrasonic and Infrasonic sound. (Easy)
27. Explain the technology of Echocardiography. (Average)

IV Answer the following questions: (3 Marks)

28. A sound wave with a frequency of 2KHz and wavelength of 35cm travels a distance of 1.5 km. How much time does it take? (Difficult)
29. Write the speed of sound in some of the following media. (Difficult)
    a. Aluminum
    b. Iron
    c. Glass
    d. Water
    e. Hydrogen
    f. Air
30. Suggest a few ways to reduce reverberation. (Average)
31. A person claps near a hill and hears the echo after 5 seconds. If the speed of sound is 346 m/s, what is the distance between the hill and the person? (Difficult)
32. List the applications of multiple reflection of sound. (Average)

V Answer the following questions: (4 Marks)

33. List the applications of Ultrasound. (Average)
34. Explain the technology of Ultrasonography. (Average)
35. Explain the method of detecting cracks and flaws in metal blocks. (Difficult)

12. Improvement in Food Resources

Learning Outcomes:

Students are able to

1. Understand the meaning and necessity of food
2. Understand nutrients and their sources
3. Understand the importance of crop yield
4. Understand the stages of crop yield
5. Understand the seasons, their types and the crops grown
6. Understand transgenic plants and their uses
7. Understand the desirable qualities and the influence of biotic and abiotic factors in crop improvement
8. Understand plant nutrients, their types with examples.
9. Understand the types of fertilizers, their uses.
10. Understand organic farming, the benefits of organic farming.
11. Understand the problems caused by excessive use of fertilizers.
12. Understand the traditional methods of irrigation.
13. Understand crop protection and its management
14. Understand dairy farming and the benefits of dairy farming
15. Understand animal husbandry and the importance of animal husbandry.
16. Understand the breeds of livestock, poultry, chicken, honey and their economic uses in animal husbandry.

Weightage according to objectives

Questions	Remembering	Understand	Application	Skill	Total
MCQ	4	1	1	--	6
1Mark	16	10	2	--	28
2 Marks	9	9	1	--	19
3 Marks	--	4	2	--	6
4 Marks	2	1	--	--	3
5 Marks	--	--	--	--	--
Total	31	25	6	--	62

Weightage on Difficulty level

Types of Questions	**Easy**	**Average**	**Difficult**	**Total**
MCQ	03	03	--	06
VSA (1M)	24	04	--	28
SA (2M)	03	15	01	19
LA (3 M)	--	04	02	06
LA (4 M)	--	--	03	03
Total	30	26	06	62

I.**Four alternatives are given for each of the following questions /incomplete statements. Choose the correct alternative and write the complete answer along with its letter of alphabet. (1 Mark)**

1. Crops grown from June to September are (Easy)
   A. Kharif crop
   B. Rabi crop
   C. Seasonal crop
   D. Rainy season crop

2. Nutrient obtained by plants through air is (Easy)
   A. Carbon
   B. Hydrogen
   C. Nitrogen
   D. Phosphorus

3. A good breed of cow found in India (Average)
   A. Bos indicus
   B. Bos bubalis
   C. Jersey
   D. Brown Swiss

4. A breed of chicken developed only for meat (Easy)
   A. Layers
   B. Broilers
   C. Aseel
   D. Leghorn

5. The type of shellfish that produces pearls (Average)
   A. Mullets
   B. Pearl spots
   C. Tuna
   D. Pearl oysters

6. The Indian native species of honeybee used for commercial production of honey is (Average)
   A. Apis serena indica
   B. Apis dar seta
   C. Apis flore
   D. Apis mellifera

11.Answer the following questions: (1 Mark)

7.What is food? (Easy)
8.Name the food sources that provide carbohydrates. (Easy)
9.Name the food sources that provide us protein. (Easy)
10.Name the food sources of fat. (Easy)
11.Name the grass that is grown as food for livestock. (Easy)
12Which nutrient is obtained from cereals, pulses, fruits, and vegetables? (Easy)
13.Name the two seasons in which crops are grown. (Average)
14.What is hybridization? (Easy)
15.What are transgenic plants? (Easy)
16.What is crop breeding? (Easy)
17.What is crop production management? (Easy)
18.What is nutrient management? (Easy)

19.What are macronutrients? (Easy)
20.What are micronutrients? (Easy)
21.What is manure? (Easy)
22.What is organic manure? (Easy)
23.What are fertilizers? (Easy)
24.What are weeds? (Easy)
25.What is dairy farming? (Easy)
26.What is animal husbandry? (Easy)
27.Name the breeds of cattle and buffalo found in India. (Average)
28.Name the breeds of cows that has high milk production. (Easy)
29.Which flatworm is found in the liver of cows? (Average)
30.What is poultry farming? (Easy)
31.Name the breeds of chickens used for eggs and meat. (Easy)
32.Name the local breed of honeybees used for commercial production of honey. (Easy)
33.Name the breed of Italian honeybee used to increase honey yield. (Average)
34.Name the types of fisheries production. (Easy)

111. Answer the following questions: (2 Marks)

35.What is Kharif season? Name the crops grown in this season. (Average)
36.How are the two crop seasons determined? (Difficult)
37.What is Rabi season? Name the crops grown in this season (Average)
38. What is the difference between organic fertilizers and liquid fertilizers? (Average)
39. How do biotic and abiotic factors affect crop yield? (Average)
40. Write the advantages of changing the maturity period of crop plants. (Easy)
41. Name the nutrients provided to plants by air, water and soil? (Average)
42. What are the effects of nutrient deficiency on plants? (Average)
43. Write the advantages of organic fertilizers (Average)
44. What are the types of organic fertilizers? (Average)
45. How is compound fertilizer prepared? (Average)
46. Mention the advantages of compound fertilizer (Average)
47. State the three ways in which pests attack plants. (Average)
48. How can grains be stored and preserved? (Average)
49. How is animal husbandry as important as agriculture? (Average)
50. Mention the types of animal husbandry. (Easy)
51. What are the methods of managing poultry? (Average)
52. Why is fish production very important? (Average)
53. Mention two types of fish farming (Easy)

111 Answer the following questions: (3 Marks))

54. What are the desirable characteristics of the crop for crop yield improvement? (Difficult)
55.Write the advantages of using fertilizers (Average)
56. What are the disadvantages of excessive use of fertilizers? (Average)
57.What is a green manure? Write its advantages. (Average)
58.What is organic farming? Write the uses of it. (Average)
59 .What is a fish farming? Write its uses. (Difficult)

1V Answer the following questions: (4 Marks)

60. Briefly explain the stages of crop improvement (Difficult))
61. What is irrigation? Explain the traditional methods of irrigation. (Difficult))
62. Mention and explain different types of crop patterns. (Difficult)

KEY ANSWERS

1. Matter in our surroundings

I. .

1. **C. C**olour
2. **A**.Fusion
3. C.Sublimation
4. C. Deposition
5. D. Copper
6. D. Solid Carbon dioxide
7. A. Pascal

II.

8. Anything that has mass and occupy space is called matter

9. States of matter are Solid, Liquid and gas.
10. Particles in matter are continuously moving. As there in increase in temperature the kinetic energy increases, so that hot food particles mix with particles in air. So we get smell of hot food from far distance.
11. The temperature at which a solid melt to become a liquid at the atmospheric pressure is called melting point.
12. SI unit of temperature is Kelvin (K).
13. Latent heat is the energy required to change the state of a substance without changing its temperature.
14. The amount of heat energy that is required to change 1 Kg of a solid into liquid at atmospheric pressure at its melting point is known as latent heat of fusion.
15. The temperature at which a liquid starts boiling at the atmospheric pressure is known as boiling point.
16. The amount of heat energy that is required to change 1 Kg of a liquid into gas (vapour) at atmospheric pressure at its melting point is known as latent heat of vaporisation.
17. Naphthalene undergoes sublimation. Solid naphthalene balls get converted into vapours (gas) without becoming liquid, so disappear as the time gets passed.
18. Change of liquid into vapours at any temperature below its boiling point is called vapourisation.
19. An earthen pot is porous in nature. These tiny pores facilitate the penetration of water and hence their evaporation from pot surface. The process of evaporation requires energy which is contributed by water in the pot as a result of which water turns cooler.
20. Acetone, petrol and perfume are volatile substances that evaporate when they come in contact with air. Evaporation is facilitated as it uses energy from the palm, hence leaving a cooling effect on our palm.

III.

21. (1) matter is made up of small particles.
    (2) presence of inter molecular space between particles.
    (3) particles are in constant motion. As there is increase in temperature the kinetic energy increases.
    (4) particles attract each other.

22. The wooden table has definite shape and has definite size. Wooden table is hard and particles in table are tightly packed. When external pressure is applied table loses its shape. So wooden table is considered to be solid.

23. In gaseous substances, the distance between the particles and the kinetic energy of the particles are maximum. The particles of perfume are mixed in the empty spaces between the gas particles and move very quickly and randomly. That is why we can smell the perfume even if we are at several meters away.

24. When solid melts, the heat applied causes the solid to change state. The solid remains constant until it reaches its melting point and melts completely. The attractive forces between the particles of the solid overcome this, causing the changes in state.

25. Steam, the particles in steam have more energy than in water at same temperature. This is because the particles in steam have acquired more heat energy in the form of heat of vaporisation. Therefore, steam causes severe burns.

26. (1) the rate of evaporation increases as the surface area increases.
(2) the rate of evaporation increases as temperature increases.
(3) the rate of evaporation decreases as humidity increases
(4) the rate of evaporation increases with increase in wind speed.

27. A plate has larger surface area than a glass/cup, promoting quicker evaporation. Hence tea or milk in a plate cols down faster.
28. In summer, it is preferred to wear light coloured cotton clothes because light colour reflects heat and cotton materials have pores that absorb sweat, facilitating evaporation, and hence causing a cooling effect on the skin.

IV.
29. (a) 25^0C—liquid form
(b) 0^0C-Solid and liquid form
(c) 100^0C-Liquid and gas form.

30. (a) 300K = (300K-273K)=27^0C
(b) 273K = (273K-273K) =0^0C
(c) 470K = (470K-273K)=197^0C

31. (a) 25^0C = (25 + 273) = 298K
(b) 373^0C = (373+273) = 646K
(c) 100^0C = (100 + 273) = 373K

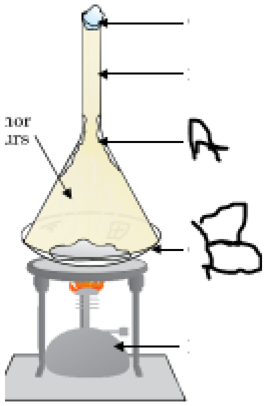
32. (a) Rigidity- Property of matter to continue to remain in its shape when treated with an external force.
b) Compressibility: It is attribute of the particles to contract their intermolecular space when exposed to an external force, thereby escalating its density.
(c) Density- It is the mass of a unit volume of a substance d=M/V.

33. The boundaries between air particles are quite loose. They are a long way part and have lot of space between them. As a result, we may move our hands freely in the air. The particles in solid block, on the oher and are bound together by a strong force of attraction. As a result, there is either some or no space between them. As a result, we will require karate expert.

34.

Characteristics	Solid	Liquid	Gas
Shape	Fixed shape	No fixed shape	No fixed shape
Volume	Fixed volume	Fixed volume	No fixed volume
Inter molecular force	Maximum	Less than solids	Very less
Inter molecular space	Very less	More than solids	Maximum

35.



36. A-Fusion
B- Vaporisation
C- Condensation
D-Solidification
E- Sublimation

2. Is matter around us pure?

I.

1. B. pure water
2. C. sugar in water
3. C. milk
4. B. Tyndall effect
5. A. Melting of ice

II.

6. A substance is a pure single form of matter
7. Mixtures are constituted by more than one kind of pure form of matter.
8. A solution is a homogeneous mixture of two or more substances.
9. A colloid is a heterogeneous mixture where tiny particles are suspended throughout another substance.
10. Solids are dispersed in liquids are called suspension.
11. An element is a basic form of matter that cannot be broken down into simpler substances by chemical reactions.
12. A compound is a substance composed of two or more elements.
13. Scattering of beam of light by the colloidal particles is called Tyndall effect.
14. Some elements have intermediate properties between metals and non-metals are called metalloids.
15. It is the state in solution at a specific temperature when a solvent is no more soluble without an increase in temperature.

III.

16. Alloys are homogeneous mixture of two or more metals or metals with non-metals
Examples: bronze, brass, stainless steel, solder metal, gun metal, German silver.

17. homogeneous mixture is uniform composition
Example: sugar in water. salt in water. sulphur in carbon disulphide. Water in alcohol.etc.
Heterogeneous mixture is non uniform composition
Example: sand and salt, sugar and salt , water in oil etc.

18. We can confirm if a colour less liquid is pure by setting it to boil. If it boils at 100°C, it is said to be pure water but if there is a decrease or increase in the boiling point, it refers given liquid is not a pure water.

19. Elements cannot break down to simpler substances. Example: copper, oxygen, iron, hydrogen, mercury etc
Compounds have fixed composition can be broken down into elements by chemical or electrochemical reactions. Example: water, methane, sugar, Salt etc

20. a) **solute** – The component of the solution that is dissolved in the solvent
b) **solvent** - The component of the solution that dissolves the other component in it.

21 .

- A solution is a homogeneous mixture
- The particles of a solution a smaller than 1nm in diameter
- They do not scatter beam of light
- Solution is stable
- Suspension is a heterogeneous mixture
- The particles of suspension can be seen by naked eyes
- It scatters beam of light
- Suspension is unstable

23. Scattering of beam of light by the colloidal particles is called Tyndall effect.
A beam of light is passed through a solution of copper sulphate does not show path of light. Mixture of water and milk show path of light and exhibit Tyndall effect.

24. The properties of colloids are:
- A colloid is a heterogeneous mixture
- The size of particles of a colloid is too small to be individually seen with naked eyes
- It scatters light beams
- They can not be separated by filtration

25. * Metals are lustre
* They conduct heat and electricity
* They are malleable and ductile
* They are sonorous

26. **Mixtures** –
*elements or compounds Just mix together to form a mixture and no New compound is formed
*A mixture has variable composition
*A mixture shows the properties of the constituent substances
*The constituents can be separated fairly easily by physical methods

Compounds – *elements reacts to form new compounds
* The composition of each new substance is always fixed
*The new substance has totally different properties
*The constituents can be separated only by chemical or electrochemical reactions

27. **Physical change** – changes occur without a change in composition and no change in the chemical nature of the substance. Example – melting of ice, Boiling of water to form steam

Chemical change – in this one substance reacts with another to undergo a change in chemical composition. Example -Rusting of iron, Burning of paper and wood

28.a) liquid, gas, fog/cloud/mist
b) liquid, solid, jelly/cheese/butter
c) solid, liquid, milk of magnesia/mud

29.**solution**- A solution is a homogeneous mixture of two or more substances.
Suspension -Solids are dispersed in liquids are called suspension.
Colloids- A colloid is intermediate between solution and suspension

30. a) centrifugation
b) evaporation
c) sublimation

IV.
31. **Physical change** – melting of ice, dissolving common salt in water
Chemical change – rusting of iron, burning of paper and wood

32. Into a vessel add a cup of milk, which is the solvent and it is heated.
Added tea powder or tea leaves to the boiling milk, which acts as solute
Tea powder remains insoluble in the milk
Sugar is solute but it is soluble in solvent
Insoluble tea powder remains as a residue
Sugar and milk stain through the filter medium, which is collected as a filtrate.

33. a. Element
b. Mixture
c. Mixture
d. Compound
e. Element
f. Element
g. Element
h. Compound

34. **Solution:**
Mass of solute(salt) = 40 g
Mass of solvent (water) = 320 g

We know,
Mass of solution= Mass of solute+ mass of solvent
=40g+320g
=360 g

Mass percentage of solution
= Mass of solute/mass of solution x100
=40/360x100
=11.1%

35.**metals** –
*Metals are lustre
*They conduct heat and electricity
*They are malleable and ductile
*They are sonorous

Non metals -
* Non Metals are not lustre
* They do not conduct heat and electricity
* They are not malleable and ductile
* They are not sonorous

5, The fundamental unit of life

I.

1. A. Ribosome
2. C. Cellulose
3. A.Centrioles
4. D. Lysosome
5. D.Nucleoid
6. B. DNA and Protein
7. D. ATP
8. A. Mitochondria and Plastid
9. B. Semi permeable membrane
10. A. Mitochondria

II.

11. Cell
12. Robert Hooke
13. Lipid
14. Mitochondria
15. Controls cell growth and reproduction
16. Jelly-like substance inside the cell membrane
17. Ribosomes
18. Provides structural support and protection
19. Lysosomes

III.

20. Prokaryotic cells lack a true nucleus and other membrane-bound organelles, while eukaryotic cells have a true nucleus and other membrane-bound organelles.
21. The cell membrane is a lipid that surrounds the cell and regulates the movement of materials in and out. It is semi-permeable and flexible.
22. Mitochondria generate energy for the cell through cellular respiration. For example, during exercise, mitochondria produce energy for muscle contraction.
23. Plant cells have a cell wall, chloroplasts, and a large vacuole, while animal cells lack these features.
24. The nucleus contains genetic material (DNA) and controls cell growth, reproduction, and metabolism.
25. Lysosomes contain digestive enzymes that break down and recycle cellular waste and foreign substances.
26. Ribosomes assemble amino acids into proteins during protein synthesis.
27. The endoplasmic reticulum is a network of membranous tubules and flattened sacs involved in protein synthesis, folding, and transport.
28. Cell division allows for growth, repair, and reproduction in living organisms, ensuring the continuation of genetic material.
29.

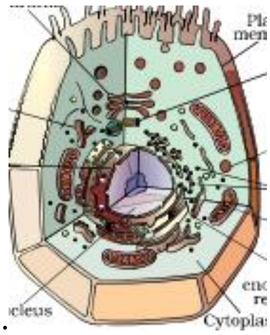


IV.

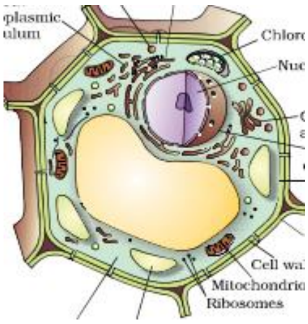
30. Mitochondria are double-membraned organelles with inner folds called cristae. They generate energy for the cell through cellular respiration, producing ATP.

31. The cell membrane regulates the movement of materials in and out, maintains cellular homeostasis, and provides structural support.
32. RER has ribosomes attached, involved in protein synthesis and folding. SER lacks ribosomes, involved in lipid synthesis and detoxification.
33. Osmosis is the movement of water molecules across a semi-permeable membrane.
34. The nucleus is a membrane-bound organelle containing genetic material (DNA), controlling cell growth, reproduction, and metabolism.
35. Lysosomes contain digestive enzymes, breaking down and recycling cellular waste and foreign substances.
36. The Golgi apparatus modifies sorts, and packages proteins and lipids for secretion or cellular use.
37. Cellular organelles work together to maintain cellular functions like energy production, protein synthesis, and waste management.
38. Cellular respiration generates energy (ATP) for the cell through glucose breakdown, essential for cellular functions and survival.

39.



40.



V.

41.

A.

A. Nucleolus
B. Nucleoplasm
C. Chromatin network
D. Nuclear pore

B.

1. Mitochondria
2. Chloroplast
3. Golgi complex

IV.

42. Soap solution is a hypertonic solution. When our fingers are in contact with it for a long time, water from cells of fingers diffuse out through the process of osmosis and the skin shrinks.
43. The cell will shrink due to water loss through osmosis, as the hypertonic solution has a higher concentration of solutes than the cell.

44. The mitochondria's double membrane and cristae structure increase its surface area, allowing for efficient energy production through cellular respiration.

45. The plant would be unable to produce glucose and oxygen, affecting its growth and development.

46. Cells can adapt to changes in temperature through various mechanisms, such as changing membrane fluidity or producing heat shock proteins. Extreme temperatures can denature proteins and disrupt cellular function.

47.Cells respond to infections through immune responses, which involve the activation of immune cells and the production of antibodies to eliminate pathogens.

6. Tissues

I.

1 .C.Prominent nucleus
2.C .lateral meristems
3.B.Permanent tissues
4.A.Collenchyma
5.A.Arenchyma
6.C. cuticle
7.B.Collenchyma
8.B.legnin
9 A.sclerenchyma
10.ACartilage
11.B.Ligament
12.C.Adipose tissue

II.

13.A group of similar cells which have same structure and performs similar functions.

14.

Plants	Animals
*Generally rooted in one place	Have ability to move freely
*They are autotrophs	They are heterotrophs

15.In multicellular organisms cells should perform specific function and should provide highest efficiency in functioning of the body
16.stomata helps in exchange of gases and transpiration.
17.Xylem and phloem together called vascular bundles.
18.sievetubes,companioncell,phloem parenchyma,phloem fibres
19.Suberin
20.Absorption and secretion
21.because matrix is hard and composed of calcium and phosphorous
22.rhythmic contraction and relaxation
23.An electrical signal that travels along a nerve fibre in response to stimulus
24.cartilage
25.cuboidal epithelium

III.

26.

Simple permanent tissue	Complex permanent tissue
*They are made up of single type of cells that perform only one common function	They are made up of more than one kind of cell that co ordinate to perform one particular function
Found in all parts of the plant	They found only in vascular bundles

27.Vessels,tracheids,xylemfibres,xylem parenchyma
Vessels :forms continuous water conducting tube
Tracheids: elongated and helps in water transport and gives structural support.

Xylem fibres :dead cells and gives mechanical strength
Xylem parenchyma: store food and minerals and helps in radial conduction of water

28.

Xylem	Phloem
It conducts water and minerals	It conducts food from leaves to all parts of the plant
Transport is unidirectional	Transport is bidirectional

29.Blood has a fluid matrix called plasma in which RBC,WBC,and platelets are suspended and plasma also contains proteins ,salts and also harmones

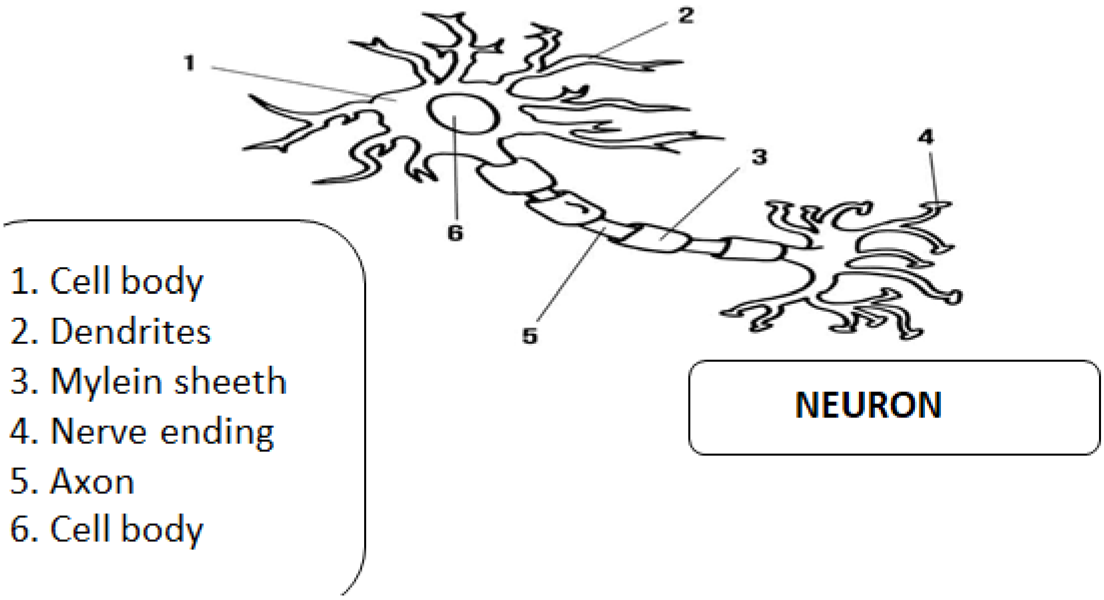
30.blood flows and transports gases digested food ,harmones and waste materials to different parts of the body.

31.* These are connective tissue and are found in between skin and muscles .They are also located around blood vessels and nerves and are present in the bone marrow.

*The space inside the organs is filled with these tissues.They support the delicate internal organs and assist in tissue repair incase of damage

IV.

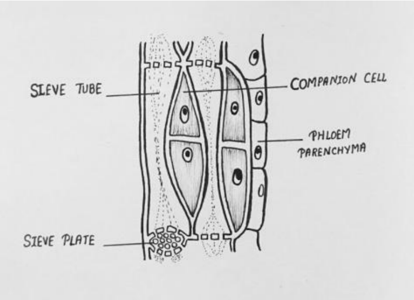
32



33.

Striated muscles	Unstriated muscles	Cardiac muscles
Long cylindrical,non tapering	Long ,tapering,no striations	Cylindrical,,non tapering
unbranched	Unbranched	Branched
Dark and light bands are present	Bands are absent	Less bands are present
Present in voluntary muscles	Present in involuntary muscles	Present in heart

34.



V.

35. a.squamous epithelial tissue
    b.Tendons
    c.Blood
    d.neuron

7. Motion

I.

1. A. Motion
2. B. Origin
3. C. Zero
4. D. Odometer
5. A. V=s/t
6. C. Circular path
7. D. a= s + u t
8. A. Straight line

II.

9. The Change of Position of Object with Time is called Motion.
10. To describe motion we need to specify a reference point called Origin.
11. The Motion along a Straight Line
12. The total distance covered by a body.
13. The minimum distance between initial and final point is called Displacement.
14. It helps to measure the distance travel of a object.
15. Yes Circular path Motion.
16. Any object covers equal distance in equal intervals of time.
17. A car moving in a crowded street. A person jagging in a park
18. The distance travel in unit time.
19. Speed of an object in definite direction. OR The displacement of an object in unit time.
20. Rate of change of Velocity. m/s2
21. The object moves in circular path with Uniform speed.

III.

22.

Distance travel	**Displacement**
Only Magnitude	Both Magnitude and direction
It is a Scalar	It is a vector quantity
Total Distance cover by a body	The minimum distance between initial and final point

23. Total distance = 20 + 15 = 35m

Total time = 5 + 10 = 15 sec

Average speed = 35 / 15 = 2.3 m/s

24.

Speed	**Velocity**
Displacement in unit time	Distance travel in unit time
No Direction	There is direction
Scalar quantity	Vector quantity

25. * All freely falling bodies having uniform acceleration
* A car travel in different speed in equal intervals of time.

26. U = 80 km/hr = 22.2 m/s
V = 60 Km/hr = 16.6 m/s
t = 5 sec

a = v- u / t
= 16.6 - 22.2 / 2
= - 5.6 / 5
a = - 1.1 m/s2

27. * Motion of moon and earth
* A satellite around earth
* a cyclist around a circular track with constant speed.

IV.

28. $V = u + at$ $v^2 = u^2 + 2as$ $s = u t + ½ at^2$

v - Final velocity
u – Initial velocity
t – time
s – distance travel
a – acceleration

29. A. r = 10 m

Distance travel = πr
= 3.14 x 10 = 31.4 m

Displacement = diameter = 20 m

30. U = 0
a = 0.1 m/s2
t = 4 x 60 = 240 sec
V = ?

v = u + at
= 0 + 0.1 x 240
v = 24 m/s

Distance travel s = ut + ½ at2
= 0 x 240 + ½ x 0.1 x 240^2
= 0 + 2880
= 2880 m

V.

31. A . 54 x 1000 / 1 x 3600 = 15 m/s
B . 6 x 3600 / 100 = 21.6 km / hr

Hint : To convert km/hr to m/s divide by 3.6
To convert m/s to km/hr multiply by 3.6

C. u = 25 m/s
v = 10 m/s
t = 5 sec

a = v-u / t
= 10 – 25 / 5
= -15 / 5 = -3 m/s2

8. Force and Laws of Motion

I.

1.A.increases with increase in weight
2.A. The object remains stationary.
3. D. both B and C
4.A.Unbalanced forces.
5.D. Newton
6. B. accelerated
7.D. No unbalanced force acts on it
8.C. A person riding a bicycle at a steady pace.
9.A. Newton's first law of motion
10.C. The product 'mv' is same for both objects
11.A. Friction force exerted on the object is less than 50N
12.D. direction and acceleration.
13.C. resist any change in the state of its motion
14.C. Newton's II law of motion
15. A. Both have same inertia
16.C.Momentum
17.C. Net force applied on the object
18.B. remain the same
19.C. The applied force.
20.A. F = m × a.
21.B. 5 ms^{-2}.
22.A. 0.5 g
23.B. decrease the rate of change of momentum
24.B. They act on different bodies in opposite directions.
25. B. won't produces the acceleration of equal magnitude.

II.

26. The velocity with which a gun moves backward after firing a bullet is called the recoil velocity of a gun.
27. Unbalanced forces.
28. Force of friction.
29.Sole of the shoe wears out due to friction between sole of the shoes and earth's surface.
30.Acceleration becomes half.
31.This is because of the frictional forces acting opposite to the direction of motion.
32.Newton's second law of motion.
33. i. It can bring about the change in the state of motion of an object
ii. It can deform an object.
34.1 newton is the magnitude of force which produces an acceleration of 1 ms^{-2} in an object of mass 1 kg.
35.The force acting between any two surfaces in contact and tending to oppose motion is called force of friction.
36.Balanced forces usually produce a change in the shape of the object.
37.No.
38.No, action and reaction act on different objects.
39.Zero.
40. Newton's third law of motion
41.No.
42. Force.

III.
43.*The action and reaction act on different objects.
*Therefore, the object moves under the action of the acting force.
44.*When two or more forces act on an object simultaneously,
*then the single force which produces the same effect as produced by all the forces acting together is known as the resultant force.
45)*****When forces acting on an object in all directions are equal, they cancel the effect of each other and are known as balanced forces.
*On the other hand, when forces acting on an object are not equal/do not cancel each other are called unbalanced forces.
46)*****The sheet shaped in form of a ball falls before the open sheet.
* Because the open sheet experiences more air resistance due to its large surface-area and this restricts its fall.
47)*****Tennis ball is lighter (less mass) than a cricket ball.
*Tennis ball moving with same speed has less momentum (mass × velocity) than a cricket ball.
* It is easier to stop tennis ball having less momentum.
48)*Yes, whenever the bodies are in actual contact or even if there is an interaction between the objects (e.g., attraction or repulsion between two magnets charges, etc.),
*Newton's third law is applicable.
49)*The force of friction is directly proportional to the weight of the object sliding over the surface.
* on the nature of the surfaces in contact.
50) *It is so, because even if the mass of the bullet is small it moves out of the gun with a very high velocity, due to which the momentum produced is high ($p = mv$).
* This high momentum of the bullet kills a person.
51)*When the passengers alight from the boat, they push the boat in backward direction.
* As a result, the boat has a tendency to slip back into water.
* This difficulty is usually overcome by the boatman by tying the boat to some rigid support.
52)*When we walk on the ground or road, our foot pushes the ground backward (action) and the ground pushes our foot forward (reaction).
*Thus, the forward reaction exerted by the ground on our foot makes us walk forward.
53)*Steel has the highest inertia.
* As the mass is a measure of inertia, the ball of same shape and size, having more mass than other balls will have highest inertia.
*Since steel has greatest density and greatest mass, therefore, it has highest inertia.
54)*According to conservation of momentum, the rifle recoils with same momentum as that of bullet.
* As momentum = mass X velocity; so light rifle will recoil with larger velocity and hence, will hurt the shoulder more.
55)*The working of the rotation of sprinkler is based on third law of motion.
*As the water comes out of the nozzle of the sprinkler, an equal and opposite reaction force acts on it.
* the sprinkler starts rotating.

IV.
56)* First law of motion-makes the forward motion slower during accidents.
Example: Pedalling of bicycle.
*When we stop pedalling, the bicycle begins to slow down.
* because of the friction forces acting opposite to the direction of motion.
*In order to keep the bicycle moving, we have to start pedalling again.
*an object maintains its motion under the continuous application of an unbalanced force.
57)*A fast moving cricket ball has a large momentum.
*In stopping or catching this ball, its momentum has reduced to be zero.
* when a cricket player moves back his hands on catching the fast ball, then the time taken to reduce the momentum of ball to zero is increased.
* Due to more time taken to stop the ball, the rate of change of momentum of ball is decreased

* small force is exerted on the hands of player. So, the hands of player do not get hurt.
58)(i) Accelerating unbalanced force.
(ii) No force.
(iii) Retarding unbalanced force.
59)* When the bullet strikes the glass pane, the part of the glass pane which comes in contact with the bullet immediately shares the large velocity of bullet and makes a hole,
* the remaining part of the glass remains at rest and is therefore not smashed due to inertia of rest.
*when a slow moving stone strikes the same glass pane, the various parts of the glass pane gets enough time to share the velocity of the stone, and the glass is smashed.
60)* Jet aeroplanes and rockets work on the principle of third law of motion.
*the hot gases come out of a nozzle with great force, i.e., action and the rocket moves with high speed upwards as a reaction.
*If we fill a balloon with air and hold it with its mouth downwards, then release the balloon,
*the air rushes out vertically downwards (action).
*The balloon moves vertically upwards (reaction).
61) *Separation between them will increase.
*Initially the momentum of both of them are zero as they are at rest.
* In order to conserve the momentum , the one who throws the ball would move backward.
*The second will experience a net force after catching the ball and therefore will move backwards that is in the direction of the force.
62)* When a high jumper falls on a soft landing site(such as cushion or a heap of sand), then the jumper takes a longer time to stop.
*The rate of change of momentum of athlete is less due to which a smaller stopping force acts on the athlete.
* the athlete does not get hurt.
* the cushion or sand, being soft, reduces the athlete's momentum more gently.
*a high jumping athlete falls from a height on to hard ground, then his momentum will be reduced to zero in a very short time.
* The rate of change of momentum will be large due to which a large opposing force will act on the athlete.
*can cause serious injuries to the athlete.
63)*In a car accident, a fast running car stops suddenly.
*Due to this the car's large momentum is reduced to zero in a very short time.
*The stretchable seat belts tightened by the passengers of the car increases time taken by the passengers to fall forward.
*Due to longer time, the rate change of momentum of passengers is reduced and hence less stopping force acts on them.
*So, the passengers may either not get injured at all or may get less injuries.
*It is obvious that seat belts reduce the passengers' momentum more gently and hence prevent injuries.
64)* According to this law, to every action, there is an equal and opposite reaction.
*When an object, say A, exert a force (action) on another object, say B, then B also exerts a force (reaction) on the A.
*These two forces are always equal in magnitude but opposite in direction.
*This law clarifies that a single force can never exist and that the forces always exist in pairs. *The two opposing forces are known as action and reaction.
*The forces of action and reaction always act on two different bodies.
65**)*** Newton's first law states that a body stays at rest if it is at rest and moves with a constant velocity , if a net force is applied on it.
*Newton's second law states that the net force applied on the body is equal to the rate of change in its momentum.

$F= ma$

$F = m(v-u)/t$

$Ft = mv-mu$

*That is, when F = 0, v = u for whatever time, t is taken.
*This means that the object will continue moving with uniform velocity - u throughout the time - t.
*If u is zero ,v will also be zero, then, object will remain at rest.

66**)** (i) Yes, this is because of relative motion.
(ii) Yes. This is because of inertia.
*We are in state of motion when compared to the train so we feel that the train is moving when actually it is at rest.

67) (i) No effect.
(ii) No effect.
(iii) No effect.

68) The SI unit of force is Newton(N).
F= mXa
F = m X v/t
F = mX (5-2)/10
2 = m X 3/10
m = 2 X 10/3
m = 6.6 kg

69) (i) Uniform motion.
(ii) Uniform accelerated motion.
(iii) Uniform motion.

V.

70)* If the resultant of various forces acting on a body is zero, the forces are said to be ‘balanced forces’.
* These forces do not change the speed but usually change the shape of an object.
Examples:
(a) Consider a wooden block lying on a table, the strings tied to its two opposite faces.
If we pull at one point , it begins to move towards left. If we pull at opposite point , it begins to move . towards right. But if we pull from both the sides with equal force, the block does not move. The two forces have now balanced each other.
(b) In a tug-of-war, the two teams pull the rope with equal effort; the rope is not moved in any direction. This is clearly because the forces exerted by the two teams are equal and opposite and thus get balanced.

71)* Inability of the body to change by itself its state of rest or state of uniform motion is called inertia.
*Types: Inertia of rest: e.g. :
(i) When a card is flicked with a finger the coin placed over it falls in the tumbler.
(ii) Only the carom coin at the bottom of a pile is removed when a fast moving carom striker hits it.
*Inertia of motion: e.g. :
(i) When a moving bus stops suddenly, the luggage might slide towards the front side of the bus and fall.
ii) We tend to fall forward when a bus suddenly stops.

72)* F =5N, a_1=8ms^{-2}, a_2 =24ms^{-2}, a=?
m_1 = F/a = 5/8 kg
m_2 = 5/24 kg
*total mass m = (5/8 + 5/24) = 20/24 kg
a = F /m = (5 X 24)/20
= 6ms^{-2}

73)* The various forces acting on the stone are:

i.The gravitational force exerted by the earth which pulls the stone downwards.
ii.The force of reaction exerted by the ground on the stone vertically upwards.
iii.The force of pushing exerted by the boy.
iv.The force of friction exerted by the stone.
*When a small boy tries to push a heavy stone, then all these forces are balanced, and therefore the stone does not move.

VI.

74)*(i) Momentum is the product of mass and velocity.
SI unit of momentum is – kg ms^{-1}.
*(ii) $v^2=u^2+2gh$
$v^2= (0)^2+2(10)(5)$
$v^2=100$
$\therefore v=10\ ms^{-1}$
Momentum=m×v
$=10\times10=100\ kg\ ms^{-1}$
*(iii) The karate player strikes the pile of tiles with his hand very fastly. In doing so, the large momentum of fast moving hand is reduced to zero in a very short time. This exerts a very large force on the pile of tiles which is sufficient to break them.

75)* Let (i) m_1=100g =0.1 kg
m_2=200 g=0.2 kg
$u_1=2\ ms^{-1}$
$u_2=1ms^{-1}$
$v_1=1.67\ ms^{-1}$
*According to law of conservation of momentum
$m_1u_1+m_2u_2= m_1v_1+ m_2v_2$
$0.1\times2 + 0.2\times1 = 0.1 \times1.67 + 0.2\times v_2$
$0.2 + 0.2 = 0.167 + 0.2\ v_2$
$v_2 =1.165\ ms^{-1}$
*(ii) It is based on Newton’s third law of motion. As boat is floating and is not fixed, so it moves backwards.

VII. Numericals

1. Given: (i) m = 10 g = 10/1000 kg,
$u = 10^3\ m\ s^{-1}$,
v = 0,
s = 5cm = 5/100 m
$v^2 – u^2 = 2as$
$0 – (10^3)^2 = 2 X a X 5/100$
$a = (−1000\times1000) / (2\times5 / 100)$
$= -10^7\ ms^{-2}$
$F = m . a = -10^5\ N$
(ii) v = u + at
$0 = 10^3 – 10^7t$
$10^7t = 10^3$
$t = 10^3/10^7 = 10^{-4}\ s$

2. Initially the body was at rest. The linear momentum of the body is p = mu = 0.
The body breaks due to internal forces. As the external force acting on it is zero, its linear momentum will remain constant, that is, zero.
$p_1 = m_1v_1$ = (200 g) × (12 m/s), towards the east.

The linear momentum of the other part must have the same magnitude and should be opposite in direction. It therefore moves towards the west.

If its velocity is v_2, its linear momentum is

$p_2 = m_2v_2 = (100\ g) \times v_2$.

Now, $m_1v_1 = m_2v_2$.

$(200\ g) \times (12\ ms^{-1}) = (100\ g) \times v_2$

$v_2 = 24ms^{-1}$.

The velocity of the other part is 24 ms^{-1} towards the west.

3. Given: $m_1 = F/a_1 = 10/12$ kg

$m_2 = F/a_2 = 10 / 24$ kg

$m = (10/12 + 10/24) = 30/24$ kg

$a = F / m = 10 / (30/24) = 8ms^{-2}$

4. Given: Mass of the bullet, $m = 4 \times 10^{-3}$ kg

Initial velocity, $u = 50\ ms^{-1}$

Depth, s = 10cm = 10/100 m

Final velocity, v = 0,

Force, F = ?

The hindrance offered by the wall to the motion of bullet is called the resistance offered by the wall.

We know

$v^2 = u^2 + 2as$

$v^2 – u^2 = 2as$

$0 – (50)^2 = 2a \times 0.1$

or, -2500 = a X 0.2

$\Rightarrow a = -12500ms^{-1}$

Force, F = ma

$= 4 \times 10^{-3} \times (-12500)$

= -50N

Thus, the average resistance offered = - 50 N

Negative sign indicates that the force is acting opposite to the motion.

5. Given: force, F = 12 N

Mass, m = 3 kg

We know that $F = m \times a$,

$12 = 3 \times a$

$a = 12/3\ m\ s^{-2}$

acceleration, $a = 4\ ms^{-2}$.

6. Given: Mass of a cracker, m = 100 g = 100/1000 kg = 0·1 kg.

Initially, cracker is at rest, u = 0

initial momentum of the cracker = mu = 0

After explosion, mass of each piece = 0·1/ 2 kg = 0·05 kg

$\therefore m_1 = 0{\cdot}05$ kg and $m_2 = 0{\cdot}05$ kg

Let, v_1 = velocity of first piece

v_2 = velocity of second piece

Momentum of cracker after explosion = $m_1v_1 + m_2v_2$

$= 0{\cdot}05\ v_1 + 0{\cdot}05\ v_2$

Applying law of conservation of momentum

$0{\cdot}05\ v_1 + 0{\cdot}05\ v_2 = 0$

$v_1 = -v_2$

The negative sign shows that v_1 and v_2 are equal in magnitude and opposite in direction.

Thus, two pieces of the cracker fly in opposite directions with same speed.

7. Given: initial velocity of sphere, $u = 0$
Distance travelled, $s = 10$ m
Acceleration of sphere, $a = 9.8\ ms^{-2}$
$v^2 – u^2 = 2as$
$v^2 – 0 = 2 \times 9{\cdot}8\ ms^{-2} \times 10\ m = 196\ m^2s^{-2}$
$v = \sqrt{196 m^2s^{-2}} = 14\ ms^{-1}$
Momentum of the sphere just before it touches the ground = mv
$= 1\ kg \times 14\ ms^{-1} = 14\ kg\ ms^{-1}$
On reaching the ground, the iron sphere comes to rest, so its final momentum is equal to zero according to the law of conservation of momentum.
Momentum transferred to the ground = Momentum of the sphere just before it comes to rest = 14 kg ms^{-1}

8. Given: the mass of the bullet, $m_1 = 0.02$ kg
Mass of gun, $m_2 = 7.5$ kg
Velocity of bullet, $v_1 = 200$ m / s
velocity of the gun, $v_2 = ?$
According to law of conservation of momentum
Total momentum of system after firing = Total momentum of system before firing
i.e., $m_1v_1 + m_2v_2 = 0$
(since initial velocities of gun and bullet before firing is zero.)
$0.02 \times 200 + 7.5 \times v_2 = 0$
$7.5 \times v_2 =- 0.02 \times 200$
$v_2 = -47{\cdot}5 = – 0.533$
$v_2 = – 0.53$ m/s

9.Given: $m = 0.4$ kg, $u = 10\ ms^{-1}$
Initial momentum of the ball = mu = $0.4 \times 10 = 4$ kg m/s
At the highest point, velocity of ball is zero,
So momentum of the ball = $0 \times 4 \times 0 = 0$

10.Given : $m_1 = 2$ kg , $a_1 = 5\ ms^{-2}$, $m_2 = 4$ kg, $a_2 = 2\ ms^{-2}$
$F_1 = m_1a_1 = 2 \times 5 = 10N$
$F_2 = m_2a_2 = 4 \times 2 = 8$ N
$F_1 > F_2$
Thus, 2 kg mass at 5 ms^{-2} acceleration would require a greater force.

11. Given: mass of the object 1: m_1=1.5kg
mass of the object 2: m_2=1.5kg
The initial velocity of the object 1: $u_1=2.5ms^{-1}$
The initial velocity of the object 2: $u_2=-2.5ms^{-1}$ (negative sign indicates object moving in the opposite direction)
Mass of combined object after the collision: $m = m_1+m_2=1.5+1.5=3kg$
Final velocity of the combined object after the impact: v
By the law of conservation of momentum, for an isolated system,
total momentum of the objects before collision = total momentum of the objects after collision.
$mv = m_1u_1 + m_2u_2$
Where, $m_1u_1 + m_2u_2$ is the total momentum of the objects before the collision and
mv is the total momentum of the combined objects after the collision.
Now, $mv= m_1u_1 + m_2u_2$
$(3\times v) = (1.5\times 2.5)+(1.5\times -2.5)$
$(3\times v) = (3.75)+(-3.75s)$

$(3\times v) = 0$
$v = 0ms^{-1}$
So the velocity of the combined object after the collision is $0ms^{-1}$

12. Given: mass of the hockey ball: m=200g=0.2kg
initial speed of the hockey ball: $u=10ms^{-1}$
final speed of the hockey ball: $v=-5ms^{-1}$
let mu = initial momentum of the hockey ball and mv = final momentum of the hockey ball.
Change of Momentum=mv−mu
Change of Momentum=(0.2×−5)−(0.2×10)
Change of Momentum=(−1)−(2)
Change of Momentum=$-3kgms^{-1}$
So,the change of the momentum of the hockey ball due to the force of the hockey stick is $-3kgms^{-1}$

13. Given: mass of the body: m=5kg
initial velocity of the body: $u=0ms^{-1}$
distance travelled on the incline: s=32m
duration of rolling: time: t =4s
We know that
$s=ut+1/2at^2$
$32=(0\times4)+1/2(a\times4^2)$
$32=12(a\times16)$
$32 =(a \times8)$
$a=4ms^{-2}$
force: F=ma
F=(5×4)
F=20N
Therefore the force acting on the body is 20N

14. Given: object mass: m=100kg
Initial object velocity: $u= 5ms^{-1}$
Final object velocity: $v= 8ms^{-1}$
Acceleration duration: t=6s
Force exerted on the given object
momentum = mass × velocity
initial momentum = mass × initial velocity
initial momentum = 100 × 5
initial momentum = 500 $kgms^{-1}$
final momentum = mass × final velocity
final momentum=100×8
final momentum=800$kgms^{-1}$
force F=ma
F=m(v−u)/t
F=100(8−5)/6)
F=100(3/6)
F=50N
So : initial momentum= 500 $kgms^{-1}$& final momentum = 800 $kgms^{-1}$
Force exerted on the object= 50N

15. Given that: mass of the frame m=200g=0.2kg
velocity of the frame: $v=15ms^{-1}$
momentum=mass×speed
momentum=0.2×15

momentum=3kgms^{-1}
Hence, the momentum of the frame is 3kgms^{-1}

16. Given that: mass m=500g=0.5kg
Force exerted: F=25N
F=ma
a=F/m
a=25/0.5
a=50ms^{-2}
So, the acceleration produced is 50ms^{-2}

17. Given: mass of hockey ball m = 200 g
initial velocity of hockey ball u = 10 ms^{-1}
final velocity of hockey ball v = -5 ms^{-1}
initial momentum of hockey ball = mu = 200 g × 10ms^{-1} = 2000gms^{-1}
final momentum of hockey ball = mv = 200g × –5 ms^{-1} = –1000 gms^{-1}
change in momentum =mv – mu = –1000 gms^{-1} – 2000 gms^{-1} = –3000 gms^{-1}
This shows that the momentum of the hockey ball is reduced to 1000 gms-1 when the hockey stick hits it.

18. Given :bullet mass m = 10 g = 0.01 kg
initial bullet velocity u = 150 ms^{-1}
final bullet velocity v = 0 ms^{-1}
duration t = 0.03 s
By first law of motion,
$v = u + at$
$0 = 150 + a (0.03)$
a = – 5000 ms^{-2}
$v^2 = u^2 + 2as$
$0 = 150^2 + 2 \times (-5000)s$
s = 2.25 m
by second law of motion,
F = ma
F = 0.01 kg × (-5000 ms^{-1})
F = -50N

19. Given :Distance travelled by truck = s = 400 metres
time taken t = 20 seconds
initial speed of the truck u = 0
we know that
$s = ut + 1/2at^2$
$400 = 0(20s) + ½(a)(400^2)$
a = 2 ms^{-2}
by second law of motion,
F=ma
mass of the truck = 7 tons = 7000 kg
The force acting on the truck
F= 7000 kg x 2 ms $^{-2}$
= 14000 kg.ms^{-2}
= 14000 N
So 14000 N force acts on the truck

20. Given : mass of the bullet m_1 = 50 g, mass of the rifle m_2 = 4 kg = 4000 g

initial velocity of the given bullet fired $v_1 = 35\ ms^{-1}$
let the recoil velocity= v_2.
Since the rifle was initially at rest, initial momentum of the rifle = 0
The total momentum of the rifle and bullet after firing = $m_1v_1 + m_2v_2$
by law of conservation of momentum,
total momentum of rifle and bullet after firing = 0 (same as initial momentum)
Hence, $m_1v_1 + m_2v_2 = 0$
$v_2 = – m_1v_1/ m_2$
$= – (50\ g \times 35\ ms^{-1})/4000\ g$
$= -0.4375\ ms^{-1}$
The negative sign indicates that the required recoil velocity is opposite to the bullet's movement.

VIII. HOTS

1.An athlete runs certain distance before taking a leap, because the inertia of motion of his body at the time of leap helps to get muscular energy.

2.Yes, the balls will start rolling in the direction in which the train was moving.

* Due to application of brakes, the train comes to rest
* Due to inertia the balls remain in motion, and begin to roll.
* The masses of the balls are not same; the inertial forces are not equal on both the balls. So, the balls will move with different speeds.

3.No, it implies that all the forces acting on the body are balanced.

4.Horse exerts continuous force to move the cart with a constant velocity to overcome the force of friction between ground and cart.

3.Atoms and Molecules

I.

1. A. NaCl
2. C. KNO_3
3. C Joseph L. Proust
4. C. 3
5. A. Calcium Oxide
6. C. Helium.
7. B. Phosphorus

8 D. Sulphur

II.

9. Law of conservation of mass states that "mass can neither be created or destroyed in a chemical reaction".

10.Law of constant proportions states that 'In a chemical substance the elements are always present in definite proportions by mass.

11. A group of two or more atoms chemically bonded together or held together by attractive forces is called molecule.

12. Electrically charged particles in compounds made of metals and non-metals are called ions.

13. The number of atoms present in one molecule of an element or compound is known its atomicity.

14. Positively charged ion Na^+
Negatively charged ion Cl^-

15. The combining power (or capacity) of an element is known as its valency.

16. Valency of oxygen = 2

17. Molecular formula of hydrogen chloride = HCl

18. Iron = Fe, Sodium = Na

19. Atoms are very small. Atomic radius is measured in nanometres.

20. Atoms are indivisible particles, which cannot be created or destroyed in a chemical reaction.

21. Atoms combine in the ration of small whole numbers to form compounds.

22. Monoatomic (1)

23. A chemical formula of a compound is a symbolic representation of its composition and actual number of atom in one molecule of a pure substance, may be an atom or a compound.

III.

24. Antoine L. Lavoisier and Joseph L. Proust postulated two important laws of chemical composition.
The laws are 1) Law of Conservation of Mass and 2) Law of Constant Proportions.

25. Law of Conservation of Mass: Mass can neither be created nor destroyed in a chemical reaction.
Law of Constant Proportions : In a chemical substance the elements are always present in definite proportions by mass.

26.The amount of oxygen reacting with 1g of hydrogen = 8g
The amount of oxygen required to react with 3g of hydrogen = 8×3 = 24g

27. a) Magnesium chloride =$MgCl_2$

b) Hydrogen chloride = HCl

c) Sodium carbonate = Na_2CO_3

d) Calcium hydroxide = $Ca(OH)_2$

28 Two or more different atoms unite to form a charged particle is called polyatomic ion. Polyatomic
ions carry a definite charge with them. Example : $NH4^+$(ammonium), and OH^- (hydroxide ion).

29. The electrically charged particles in a compound made of metals and non-metals are called ions.
Positively charged ion (Cation) Na^+ Negatively charged ion (Anion) Cl^-

30. The elements present in the compounds are,

a) Calcium hydroxide = calcium, oxygen, hydrogen

b) Hydrogen chloride = hydrogen and chlorine

c) Sodium chloride = sodium and chlorine

d) Potassium sulphate = potassium, sulphur and oxygen

31. Atomic mass of H_2O and HNO_3 :
(Atomic mass of H =1, Atomic mass of N =14, Atomic mass of O=16)

$H_2O= H_2+O$
= 2×1+1×16
= 18u

$HNO_3= H+N+O_3$
=1×1+1×14+3×16
=1+14+48
= 63u

IV.

32. The correct symbols of the following elements.

a) Iron - Fe b) Aluminum- Al

c) Cobalt- Co d) Silver- Ag

e)Sodium- Na f) Argon- Ar

33. The electrically charged particles in a compound made of metals and non-metals are called ions.

Polyatomic positive ion = NH_4^+,

Polyatomic negative ion = OH^- , HCO_3^-

34. The formula unit mass of a substance is equal to the sum of the atomic masses of all the atoms in it.

The formula unit mass of NaCl =1×23+1×35.5 = 58.5u
(Mass of sodium Na=23, mass of chlorine Cl=35.5)

35. Rules to be followed while writing a chemical formula:

• Valences or charges of the ion must be matched.

• When the compound contains a metal and a non-metal, the metal or its symbol should be written first. For example: calcium oxide [CaO], Sodium chloride [NaCl]. Non-metals such as oxygen and chlorine should be written on the right side, while metals such as calcium and sodium should be written on the left side.

• If the compound consists of polyatomic ions, the ions should be written in brackets. When the number of polyatomic ions in the compound is 1, no bracket is needed. For example, NaOH.

36. a) Nitrogen - N and Fluorine - F

b) Elements derived from Latin are Iron Fe (Ferrum), Copper Cu (Cuprum)

c) Helium He (Helium), Aluminum Al (Aluminium)

V.

37. a) Valence of element X is 4, valency of element Y is 1

X   Y
| |
4   1
X1 Y4,   Example - CCl_4

b) Valency of element X is 2, valency of element Y is 2,

X   Y
| |
2   2
X2 Y2 = XY compound is formed, Example - CaO

38. a) Sodium oxide = Na_2O

b) Sodium sulphide = Na_2S

c) Magnesium hydroxide = $Mg(OH)_2$

d) Calcium hydroxide = $Ca(OH)_2$

39. 5g of magnesium oxide is produced when 3g of magnesium is burned in 2g of oxygen. It means that when magnesium reacts with oxygen, they are combined in the ratio of 3:2 to form magnesium oxide.

Thus When 3.0g of magnesium is burned with 5.0g of oxygen, 5.0g of magnesium oxide is formed.
The remaining oxygen is not consumed. It is based on the law of definite proportions.

4. Structure of atom

I.

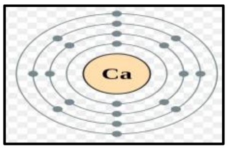
1. C. J J Thomson
2. B. Canal Ray
3. A. Dalton
4. B. 2000
5. A. 1
6. B. J J Thomson
7. A. Gold
8. D. 4u
9. C. password straight without deflection
10. A. positive
11. C. 10^5
12. D. nucleus
13. B. acceleration
14. B. 8
15. D. 4
16. A. valence electron
17. C. electrons
18. B. 7
19. D. Uranium
20. C. 15, 15,16
21. D. nucleon
22. C. isobars

II.

1. Protons, neutrons and electrons
2. 10
3. All the three elements pocess one electron is outmost Shell.
4. Proton - 9 and neutron - 10.
5. 8
6. Electronic configuration - 2,5 and the element is Nitrogen atom.
7. As these rays emerged from anode and passed through the small holes or canals in the cathode, they are termed as canal rays.
8. Atomic mass number of element X is 9 and element Y is 10.
9. None of the ions because H^+ has 0 electron in its outermost shell and H^- has two electrons in its outermost shell.
10. As the element has 7 electrons in its outermost shell, it will accept one electron. Hence the ion formed from it will be having a charge of -1.
11. The formula for maximum number of electrons in a shell - $2n^2$
As N is 4th shell = $2(4)^2 = 2(16) = 32$.
12. It's charge is zero because in this element both cation and anion are equal in number.
13. Atomic mass number is A+2
14. Atomic number is 17
15. Atomic number is 20
16. The valency of all the isotopes of an element will be the same.

III.

1. a. Cobalt - treatment of cancer
b. Iodine - treatment of goitre
2. In order to overcome the objections raised against the Rutherford model Neils bohr put forward the following postulates :
i. only certain special orbits known as discrete orbits of electrons, are allowed inside the atom.
ii. while revolving in discrete orbits the electrons do not radiate energy.
3. These two pair of elements are called as Isobars.
The number of neutrons present in Argon atom is 22.
4. An element whose outermost shell is filled with electrons and show little chemical activity, having a valence of zero are called inert gases. Example: Helium,Neon, Argon etc,.
5. i. the maximum number of electrons present in the Shell is given by the formula $2n^2$
ii. here in indicates the orbit number or energy level 1,2,3,4…
iii. the maximum number of electrons in different shell are
K shell = $2(1)^2 = 2(1) = 2$
L shell = $2(2)^2 = 2(4) = 8$
M shell = $2(3)^2 = 2(9) = 18$ etc,.
iv. electrons are not accommodated in the given shell unless the inner shells are filled.
6. a. because most of the Alpha particles passed through the gold foil without getting deflected.
b. because very few particles were deflected from their path.
7. When a measuring scale is rubbed to dry hair and brought near the pieces of paper, the paper pieces stick to the measuring scale because the scale becomes ionized. From this we will come to know that atom is made up of charged particles.
8. John Dalton, J.J. Thomson, Rutherford, Niels Bohr.
9.



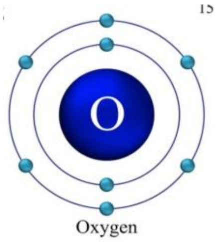
10. Atoms of the same element having the same atomic number but different atomic mass numbers are called isotopes.
The isotopes of hydrogen are Protium ($_1H^1$),
Deuterium ($_1H^2$)
Tritium ($_1H^3$)

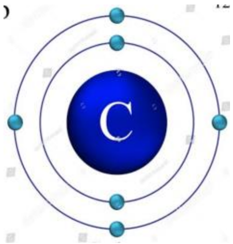
IV.
1. A. D
b. B and C
c. A and E
2. a. $_{13}X^{27}$
b. Number of neutrons = Atomic mass number - Atomic number
= 27-13 = 14
c. Number of electrons =13
K-2, L-8, M-3 (or) 2,8,3
3. **<u>Proton</u>** – i. Positively charged particle
ii. Has unit mass
iii. Symbol - P^+
iv. Charge +1
<u>Neutron</u> – i. Has no Charge
ii. Has unit mass
iii. Symbol - n
iv. Charge 0
<u>Electron</u> – i. Negatively charged particle

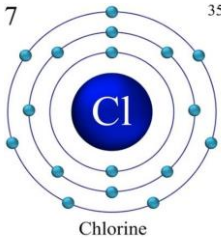
ii. Mass negligible
iii. Symbol e^-
iv. Charge -1
4. a. Nitrogen (z=7)
7=2,5.
Valency is 3
b. Neon(z=10)
10=2,8
Valency is 0
c. Magnesium (z=12)
12=2,8,2
Valency 2
5. This atomic model was proposed by JJ Thomson.
He proposed that
i. An atom consists of positively charges sphere and the electrons are embedded in it.
ii. the negative and positive charges are equal in magnitude. So the atom as a whole is electrically neutral.
6. Symbol- K
Atomic number - 19
Atomic mass number - 39 Number of protons - 19
Number of neutrons - 20
Number of electrons - 19
7. a. Proton - Goldstein in 1886
b. Neutron - James Chadwick in 1932
c. Electron - J. J. Thomson in 1900
8. The results of Rutherford's experiment are follows:
i. Most of the fast moving Alpha particles passed straight through the gold foil.
ii. some of the Alpha particles were deflected by the foil by small angles.
iii. surprisingly one out of every 12000 particles appeared to rebound.
9. i. There is a positively charged centre in an atom called the nucleus.
ii. the electrons revolve around the nucleus in circular path.
iii. the size of the nucleus is very small as compared to the size of the atom.

V.
1. a. They have the same number of protons and electrons, which are the primary determinants of an atom's chemical properties.
b. because in an atom, the negative and the positive charges are equal in magnitude
c. because they have completely filled outermost shell with stable electronic configuration and their combining capacity or valency is zero.
d. Because ions achieve a stable configuration by gaining or losing electrons in the outermost shell to achieve an octet structure.
2. a. Atomic number
b. Isotopes
c. Isobars
d. Atomic mass number
3. i. The mass of an atom of any natural element is the average mass of all atoms of that element found in nature.
ii. Chlorine exists in nature in the form of two isotopes with masses 35u and 37u, which are found in the ratio 3:1.
iii. Based on this, the average atomic mass of a chlorine atom =[(35x75/100+37x25/100)]
=(105/4+37/4)
=142/4
=35.5u

4. a. 

b. 

c. 

d. 

VI.

1.a. Rutherford proved the existence of a positively charged nucleus through his gold foil experiment. Fast-moving alpha particles were made to fall on a thin gold foil. It was observed that some alpha particles were deflected at large angles and some particles were seen to rebound or deflected at 180°. Since alpha particles are positively charged, it indicated the presence of a dense, positively charged center within the atom.

b. Rutherford failed to explain the stability of the atom.

Electrons are accelerated while moving in circular orbits. During the acceleration, they release energy and finally fall into the nucleus. If this happens, the atom is very unstable.

c. They chose gold foil because gold is a highly malleable metal and he wanted as thin layer as possible.

2. a. This atomic model was proposed by Neils Bohr.

b. the postulates of a Bohrs atomic model are:

i. only certain special orbits known as discrete orbits of electrons are allowed inside the atom.

ii. while revolving in discrete orbits the electrons do not radiate energy.

iii. These orbits are represented by the letters K, L, M, N… or the numbers n=1,2,3,4…

c. The maximum number of electrons hold by M shell is 8.

9. Gravitation

I.

1) D. Pascal

2) B. Less than the earth

3) A. 6.673×10^{-11} Nm^2 kg^{-2}

4) C. same

5) D. Both reaches at a time

II.

6)Gravity is the force of attraction that pulls objects towards each other .

7)Buoyancy is the upward force exerted by a fluid on an object partially or fully immersed in it.

8)The thrust on an unit area is called pressure.

9)$9.8ms^{-2}$

10)Sky diving.

11)Yes

III.

12)The law of gravitation states that the force of attraction between any two objects is proportional to the product of their masses and inversely proportional to the square of distance between them.

13)Mass is the measure of the amount of matter in an object, while weight is the force exerted on that object due to gravity.

14)When a body is immersed fully or partially in a fluid, it experiences an upward force that is equal to the weight of the fluid displaced by it.

15) a) mass of object
b) distance between them

16)Gravitational acceleration ‘g’ is greater at poles and smaller at equator due to earths shape.

17)Gravitational force, no, reason : Newton’s first law and rotation and principle of inertia.

IV.

18)a) the force that binds us to the earth
b) the motion of the moon around the earth
c) the motion of the planets around the sun
d) the tides due to the moon and sun

19) $F=1.001\times10^{-8}N$

V.

20)a)$4ms^{-1}$
b)$2ms^{-1}$
c)0.8m

21) $9.8ms^{-2}$

VI.

22)a) $P=1000Nm^{-2}$
b)$P=400Nm^{-2}$

23) Archimides’ Principle:When a body is immersed fully or partially in a fluid, it experiences an upward force that is equal to the weight of the fluid displaced by it. Experiment: Activity 9.7 given in text book. Applications: Ships, submarines, lactometer, hydrometer etc,

10. Work and energy

I.

1. D. Joule
2. D. Chemical energy to electric energy
3. A. Is Positive
4. A. Increases the kinetic energy of the object.
5. B. Mechanical energy
6. C. Law of conservation of energy
7. B. 3.6 x 10^6 J

II.

8. a. Force must be extended on the body

b. The body must have changed the position.

9. The work done by a force exerted on a body is equal to the product of the magnitude of the force and the distance moved by the body in the direction of the force.

Work done = force x displacement w=F x S.

10. When a force of I newton is applied to a body, the work done when the body moves one meter in the direction of the force is called one joule of work.

11. Yes, displacement is possible. When a body is in uniform motion, the force acting on the body is zero. But the positon of the body changes. Therefore, a body can change position when no force acts on it.

12. Yes, it is agreed. Even if many forces act on an object, its acceleration can be zero. This is because the force acting on an object is in uniform motion.

13. The ability to do work is called energy. The unit of energy is Joule.

14. Mechanical energy (potential energy + kinetic energy), thermal energy, chemical energy, electric energy and light energy, are some forms of energy.

15. When pedaling a bicycle, the rider’s muscle energy is converted into thermal energy of the rider’s body. Muscle energy → thermal energy and kinetic energy.

16. No, there is no loss of energy either, because the muscle energy used to push a huge rock is transformed into body heat, causing the increase in body temperature.

17. 1 watt means 1 joule of work done by an object in 1 second.

18. The rate of work done is called power. Power=work/time. P=w/t.

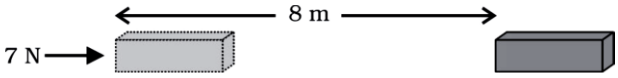
19. Average power is the ratio between the total power used and the total time used.

20. The commercial unit of energy is the kilowatt hour (kWh).
21. If the force acting on a body is perpendicular to its displacement, the work done is zero. The gravitational force on a satellite orbiting the earth is perpendicular to its displacement. Therefore, the work done is zero.

III.

22. No, he has not worked. When a person carries a load of hay on his head, their no displacement of the load of hay, even though the force of gravity is acting on the person's head, the person is not exerting force on his head due to the load of grass. Therefore, the work done is zero.

23.



Force exerted on a body, F=7N
Distance moved by the body in the direction of the force, S=8m
Work done w=?
Work done = force x displacement
W=F x S = 7N x 8m = 56Nm or 56J

24. The force exerted on the plough by a pair of oxen, F=140N
Length of land to be ploughed, S=15m
Work done w=?
Work done = force x displacement
W=F x S = 140N x15m = 2100 Nm or 2100J

25. The energy that bodies acquire due to motion is called kinetic energy. The expression that describes kinetic energy of a body is $E_K = \frac{1}{2}$ mv^2.

26. The potential energy of a body falling freely towards the ground decreases and the kinetic energy increases. When the body touches the ground, all the potential energy is converted to kinetic energy. When the body touches the ground all the kinetic energy is converted to thermal energy and heat energy, this kinetic energy of body can deform the ground depending on the nature of ground.

27. Mass of the body, m = 15 kg, velocity of the body, v = 4 ms^{-1}
$E_K = \frac{1}{2}$ mv^2 $E_K = \frac{1}{2}$ x 15 kg x 4 ms^{-1} x 4 ms^{-1} = 120 J.

28. The energy obtained by a body from its position or design is called Potential energy. The expression that describes kinetic energy of a body is E_P = mgh.

29. Mass of body, m=10kg, displacement/height, h=6cm and acceleration due to gravity=9.8 ms^{-2}, Potential energy = mgh =10kg x 9.8 ms^{-2}x 6cm = 588J.

30. Electric power consumed by electric bulb=1000J, time taken = 10 sec Power=work/time
P=w/t $\frac{1000\text{J}}{10\text{s}}$ = 100 w

31. Power of electric bulb = 60 w = 0.06 kw, time used, t = 6 h
Energy = power x time taken
= 0.06 kw x 6 h = 0.36 kwh = 0.36 units

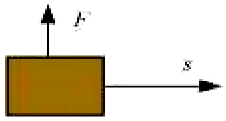
IV.

32. Kinetic energy: - Flowing water, moving bus an arrow shot from a bow
Potential energy: - pressed spring, a stretched rubber band, a stone on the top of building.

33. No, the law of conservation of energy is not violated. The sum of the kinetic energy and the potential energy of a body is its mechanical energy. When a body if falling freely a decrease in gravitational

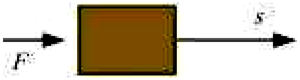
potential energy at a point in its path leads to an increase in kinetic energy by an equal amount (air resistance is neglected here) therefore, gravitational potential energy is continuously converted into kinetic energy.

34. Situation-1



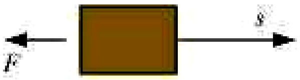
The work done is zero. The direction of the force acting on the body is perpendicular to the displacement. Therefore, the work done is zero.

Situation-2



The work done is positive. The direction of the force acting on the body is the direction of displacement of the body. Therefore, the work done is positive.

Situation-3



The work done is negative. The direction of the force acting on the body is opposite to direction of displacement of the body. Therefore, the work done is negative.

35. Mass of boy=50 kg x 10ms^{-2} =500 N

Total height of stairs leading to a floor = h= 45x15m/100 = 6.75 m

Time taken to climb the stairs= t= 9s

Capacity = P= mgh/t

= 500N x 6.75m/9s = 375w

Capacity of boy = P = 375w

11.Sound

I.

1. C. Vibration
2. A. Vocal cords
3. B. Disturbance
4. B. Longitudinal waves
5. A. 17.2m
6. A. 20Hz – 20,000Hz
7. D. Vaccum
8. D. Absorb sound
9. A. 0.1 seconds
10. B. Dry cell

II.

11. The matter or substance through which sound is transmitted is called a medium.
12. A wave is a disturbance that moves through a medium when the particles of the medium set neighbouring particles into motion.
13. A kind of rapid to and fro motion of an object.
14. The distance between two consecutive compressions or rarefactions.
15. Number of oscillations per unit time.
16. The time taken by two consecutive compressions or rarefactions to cross a fixed point.
17. The way the brain interprets the frequency of an emitted sound.
18. The magnitude of the maximum disturbance in the medium on either side of the mean value is called the Amplitude.
19. The speed of a wave is defined as the distance which, a point on a wave travels per unit time.
20. A repeated sound reflected from a surface.
21. The repeated reflection that results in the persistence of sound.

III.

22. Transverse Wave: The disturbance of the particles is perpendicular to the direction of wave propagation.
    Longitudinal Wave: The disturbance of the particles is parallel to the direction of wave propagation.

23. a. Meter (m)
    b. Second (s)
    c. Hertz (Hz)
    d. meter / second (m/s)

24. Tone: A sound having a single frequency.
Note: Sound produced due to a mixture of several frequencies.

25. Music – Music is pleasant to hear and is of rich quality .
    Noise – Noise is unpleasant to hear and is of lower quality.

26. Ultrasonic Sound: Sound waves with frequencies above 20,000 Hz.
Infrasonic Sound: Sound waves with frequencies below 20 Hz.

27. * A technology that uses ultrasonic waves.
* These waves are reflected from different parts of the heat to obtain an image of the heart.

IV

28. Given:

Frequency (n) = 2KHz = 2000Hz
Wavelength (λ) = 35 cm = 0.35 m
Speed (v) = λ × n = 0.35 × 2000 = 700 m/s

Time to travel 1.5 km

$t = \frac{d}{v} = \frac{1.5 \; x \; 1000m}{700 \; m.s-1} = \frac{15s}{7}$ = 2.1 seconds

29. Speed (m/s)

a. 6420
b. 5950
c. 3980
d. 1531
e. 1284
f. 346

30. * The roof and walls of the auditorium are generally covered with sound absorbent materials like compressed fibre boards or rough plaster.
* The seat materials are also selected on the basis of their sound absorbing properties

31. Given:

Speed of sound = 346 m/s
Time = 5s
Distance travelled by sound = speed × time = 346 × 5 = 1730 m
As the sound travels to the hill and back, actual distance = 1730 ÷ 2 = 865 m

32. * Megaphones, horns, shehnais – Conical tubes are attached to prevent sound from spreading.
* Stethoscope – The sound of the patient's heartbeat reaches the doctors ear due to multiple reflections the.
* Concert halls and cinemas – Ceilings are built in curved shapes to ensure effective sound reflection and clarity.

V

33. * Ultrasonic waves travel through the tissues and get reflected.
* These waves are then converted into electrical signals.
* The images generated are then displayed on a window or printed on a film.

34. * Ultrasound is generally used to clean parts located in hard to reach places.
* Can be used to detect cracks and flaws in metal blocks.
* Used in echo cardiography
* Used in Ultrasonography techniques.

35. * Metal blocks are used in construction of big structures like buildings, bridges, machines and also scientific equipment.

* Ultrasonic waves are allowed to pass through the metal blocks and detectors are used to detect the transmitted waves.
* If there is even a small defect, the ultrasound gets reflected back indicating the presence of the flaw or defect.

12.Improvement in Food Resources

I.

1. Kharif crop
2. Carbon
3. Boss Indicus
4. Broiler
5.Parl oyster
6.Apis serena indica

II.

II

7. Food is a substance that contains protein, carbohydrates, fat, vitamins, and minerals that are essential for the development, growth, and health of our body.
8. Wheat, rice, maize, millet, and white jowar.
9. Pulses like chickpeas, lentils, peas, urad dal, lentil, dry fruits 10. Oil seeds like mustard, flax seeds, sunflower seeds,
11. Bur seeds, oats
12. Carbohydrates, proteins, lipids, vitamins, minerals, fiber.
13. Rabi season and Kharif season.
14. Hybridization is the process of combining desired traits into crop varieties.
15. Transgenic plants are improved crop plants that have been obtained by adding a channel that provides desired traits.
16. Crop breeding is the improvement of varieties with good quality, high yield, and disease resistance.
17. Crop production management should be cost-free or low-cost production.
18.Nutrient management is the provision of nutrients required for good growth and yield of crop plants. These nutrients are supplied by air, water and soil.
19.Nutrients required in large quantities by plants are macronutrients.
20. Nutrients required in small quantities by plants are micronutrients.
21. Manure is organic matter, typically animal waste or plant waste. Used as fertiliser to improve soil fertility and promote plant growth.
22.Organic manure is the manure produced from plant waste and animal faeces.
23.Fertilizer is a substance added to soil to promote plant growth, increase crop yields and improve soil fertility. Fertilizer provide essential nutrients such as nitrogen, potassium and phosphorus.
24.Unwanted plants that grow along with crop plants in agricultural field.
25.A method of maintaining the health of animals and promoting milk production.
26.The scientific management of livestock is called animal husbandry.
27. .Cattle -Bos indicus, Buffaloes -Bos bubalis
28.Jersey and Brown Swiss
29. Fluke worm (liver fluke)
30. Method of raising chickens for egg and meat production.
31. Broiler, Layers
32.Apis serena indica, Apis dar seta (stone honey) Apis flore (small honey)
33.Apis melli fera.
34. Sea fishing and Inland fishing

III.

35. The period from June to October is called Kharif season. The crops are- Paddy, Soybean, Agar, Maize.
36. The seasons are divided on the basis of the weather conditions, temperature, and light period available to the crops.
37. The period from October to March is called Rabi season and wheat, gram, mustard seed are grown.
38. Organic fertilizer: *Organic fertilizer is made from plant and animal waste *Provides less nutrients to plants *Has more water holding capacity *The crop product is free from pollution.

Fertilizer: * Fertilizer is made from N P K chemicals *Provides more nutrients to plants *Has less water holding capacity. *The crop product is polluted.

39. Biological factors such as insects and worms damage crop plants and yield. Inorganic factors such as drought, salinity, heat, cold and frost also reduce crop yield.
40. Air- Carbon Oxygen Water- Hydrogen Oxygen Soil- Macro nutrients such as nitrogen, phosphorus, potassium, calcium, magnesium, sulphur. Micro nutrients such as iron, manganese, copper, chlorine
41.1 It is economically profitable 2 Crops can be grown many times in a year. 3 Production costs are reduced 4 It makes the harvesting process easier, 5. It reduces crop losses during harvesting.
42. Reproduction and growth of plants are stunted. They are affected by diseases and yield is stunted.
43. It can enrich the soil with nutrients, increase soil fertility, help improve soil structure, increase water holding capacity of the soil, prevent waterlogging, reduce the use of fertilizers and help protect the environment.
44. Mixed fertilizer and Fertilizer.
45. Mixed fertilizer is a fertilizer obtained by decomposing agricultural wastes such as cow dung, vegetable waste, household waste, sewage waste, hay, dead plants, weeds, etc. in a pit.
46. Mixed fertilizer contains maximum amount of organic matter and nutrients.
47.1. Pests cut the roots, stems and leaves. 2. pests suck the sap from different parts of the plant. 3. Pests bore into the stems and fruits.
48. The grains should be dried well in the sun and stored in dry storages and preserved using chemical fumes.
49. Animal husbandry is also very important as it provides highly nutritious food and provides economic support to humans.
50.. Cattle farming, poultry farming, fish production, beekeeping.
51. Cleanliness 2 Protection 3 Protection from bacteria, viruses, germs, 4 Specific temperature maintenance 5. Hygiene.
52. Fish is a source of protein in our diet, so it is very important.
53. 1 Obtained from natural resources (lakes, seas, lakes) This is called natural fishing 2 Fish farming or agro-fishery (This is the method of raising fish in rivers, lakes, seas, etc.).

III.

54. Height and width of branches, short stature, high yield, disease resistance are some of the desirable characteristics foe crop yield improvement.
55. Plants grow well, will be healthy, and give high yields.
56. Excessive use of fertilizers pollutes the soil. Water pollution occurs. Excessive chemical elements in foods can cause increased bioaccumulation. Microorganisms in the soil are destroyed and the texture of the soil changes.
57. Green manure is the cultivation of some plants like sun hemp or gaur before sowing agricultural seeds and then ploughing and mixing them with the soil. Uses- Soil can be enriched with nitrogen and phosphorus.
58. Organic farming is the practice of using organic fertilizers like blue green algae, biopesticides, mixed cropping, intercropping, crop rotation systems, which provides nutrients along with pest and weed control.
59. A method of raising fish using a combination of 5 or 6 fish species in a fish pond, for example- Katla, Rohu, Mriyal, Belikaf.

IV.

60.A High yield- Increasing the quantity of crop production, improving the quality of crop production and increasing the durability of the crop in terms of yield b Biological and abiotic resistance- Protecting crops from diseases, pests, and pests Protection from biotic factors such as pests and producing crop varieties that are resistant to abiotic stresses such as drought, salinity, heat, cold, and frost c Broad adaptation- Growing crop varieties that are adapted to different climatic conditions in different regions. d Variation in maturity period- Reducing the life span of crop plants.

61.Providing water to crop at regular intervals is called irrigation. Traditional methods of irrigation include: 1. Canal irrigation: water is distributed through canals and channels.

2. Well irrigation: water is lifted from wells using manual or mechanical means.
3. Tank irrigation: water is stored in tanks and distributed through channels.
4. Dhekli, Rahat, Maot some of the other traditional methods of irrigation.

62. Crop rotation, mixed cropping, intercropping, mixed cropping- Growing two or more crops at the same time on the same piece of land. Crop rotation- Growing different crops in a predetermined sequence on the same piece of land. Intercropping- Growing two or more crops at the same time on the same piece of land in a specific pattern. Example- Soybean and maize are mixed and sorghum is mixed.